Engineering News-Record

A Consolidation of Engineering News and Engineering Record
McGRAW-HILL COMPANY, INC.
May 23, 1918

Though taken from a height of 6000 feet, this photograph furnished excellent material for an accurate map of No Man's Land and the German trench system. R. K. Tomlin, Jr., War Correspondent of Engineering News-Record, tells in This Issue how such work is carried on by the Topographical Division.

The Daylight Roof

Federal Glass Tile
"Makes Your Work Lighter"

Here's a factory made unit with all the features of the famous Federal Cement Tile. It's strong, well reinforced cement roof tile with a glass insert firmly imbedded and cushioned in the cement, free to contract and expand, giving 62½% daylight. No metal or putty to wear out. Each tile carries its own self-contained condensation gutter, and deposits precipitation outside and upon the tile adjacent and below it.

Note the perfectly diffused top light obtained through the foundry roof of the Great Western Smelting and Refining Company, Chicago, Ill., by the use of Federal Large Glass Tile

Beams of Illumination Are Shot Directly from the Roof to the Working Floor

Remember a Federal roof is indestructible and weighs but 16 pounds per square foot. It will carry 1,000 pounds center concentrated load before the glass will crack, and over 1,800 pounds center concentrated load before failure of slab. Each unit is made of Portland Cement, properly reinforced, fully seasoned and stored in our own fireproof, daylight warehouses until shipped to the job ready to be laid in any weather or temperature with none of the dangers and delays of "poured on the job" construction.

These slabs with glass panels interlock and interchange with our standard tile for pitched roof construction. The combination presents a continuous fireproof and weatherproof roof with lighting space wherever it's needed.

Federal Cement Tile Company

920 Westminster Building :-: :-: Chicago, Illinois, U. S. A.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. McGRAW, President

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN, Editor — CHARLES WHITING BAKER, Consulting Editor

Volume 80 — NEW YORK, THURSDAY, MAY 23, 1918 — Number 21

A Billion for the Railroads

ANNOUNCEMENT that the railroad administration has approved the budgets of the railroads to the extent of nearly a billion dollars is an encouraging indication that the administration appreciates the need for extensive expenditures to bring and keep the railroads up to war strength. The equipment total of $480,000,000 is somewhat in excess of the estimated cost of the 1025 standard locomotives and 100,000 standard cars recently ordered. Allowances are also made of $440,000,000 for additions and betterments and $18,000,000 for extensions, while items totaling $349,000,000 were disapproved. The items that make up the totals are not announced. It is understood, however, that the administration looked favorably on double-tracking, sidings and terminal improvements, and unfavorably on most other construction.

Presidential Approval of Research

FOR many years the national Government has been one of the leading scientific research agencies of the country. Its investigations, through the Bureau of Standards, the Department of Agriculture, the Public Health Service and other offices, have been varied and valuable. Manifestly, though, with every conceivable problem a proper one for Government interest, only a small part of the possible field for research could be covered. Now, through Presidential proclamation (an executive order issued May 11) scientific research is officially given a coördinating and promotional agency that is to function not merely during the war but during peace times as well. That body is the National Research Council, which the President rightly says has, through its work in organizing research and in securing the coöperation of military and civilian agencies in the solution of military problems, demonstrated its capacity for larger service. Accordingly, he asks the National Academy of Sciences to perpetuate the council and then specifies its duties. These duties, detailed in the news pages of this issue, cover the stimulating and coördinating of "research in the mathematical, physical and biological sciences, and in the application of these sciences to engineering, agriculture, medicine and other useful arts, with the object of increasing knowledge, of strengthening the national defense and of contributing in other ways to the public welfare." This surely is a broad assignment and scientific men the country over have reason to feel gratified not merely because of the good that can be expected to flow from such a permanent agency, but because the President, by official order, has given the broadest sanction to research work. His approval, too, is a fitting tribute to the excellent work done by the Council since we entered the war.

Revise Cast-Iron Pipe Specifications

REVISION of cast-iron pipe specifications may now be expected to proceed in view of the action taken by the American Water-Works Association last week and the results of the questionnaires sent out by it and by the New England Water-Works Association. The conclusive vote summarized on p. 1015 indicates a demand for revision and a wise willingness to leave the more highly technical questions for the decision of the committees. After a "deadlock by courtesy" of more than a year it is to be hoped that the manufacturer members on the two committees will join with the user members in combining the two old standard specifications into a single real up-to-date standard, to go into effect a reasonable time after the conclusion of the war.

Unjust Barrier to Commissioned Service

WAR necessities have reformed the army to the extent of revising the hitherto ironclad rule which made it impossible for an experienced civilian member of the Engineer Department to receive a commission in the Corps of Engineers. In the past year many such engineers have been made reserve officers and many others put in responsible charge of works heretofore only intrusted to the graduates of West Point. Being a civilian employee of the army has not militated against one's chances of being honored with a commission at least for the duration of the war. Unfortunately the Navy Department has not been so fair-minded. A number of the civilian engineers in the Bureau of Yards and Docks, men of the highest technical ability and familiarity with the service, were recommended for reserve commissions by the bureau, but were rejected by Secretary Daniels because of their affiliation with the department, although they may have been superior in qualifications to most of the seventy who were commissioned. No better way to breed discontent and reduce efficiency in a technical force can be imagined.

Standardized Railroad Equipment

OPINIONS differ as to whether the standardizing of railroad cars and locomotives is a wise move. It appears to this journal that the affirmative is fairly well proved in the case of cars, but is not nearly so clear with respect to locomotives. The great difference is that cars of any road are likely to be hauled anywhere, whereas locomotives are designed, and properly, to fit the operating conditions of certain roads or divisions.

As to cars, the railways have long been working toward the adoption of a standard freight car. The Master Car Builders' Association has been standardizing details of freight-car construction ever since interchange between different roads began. The work of this body and of such organizations as the American Society for Testing Materials and the American Railway Association has, in fact, laid the foundation which made it possible for the Government authorities, in the short period of four months, to develop standard freight-car designs. The railroad administration deserves credit for having brought about in a short time what might have been delayed for years under private control.

There will not be much saving in first cost because of standardization. Freight cars have usually been manufactured in lots of 1000 and upward. There would be a material advantage in the matter of repairs if the stock of repair parts necessarily kept on hand at interchange points could be reduced, and especially if the delay involved in waiting for repair parts could be obviated. Standardization will help in this direction; but for many years, until the great variety of cars already in service has been diminished, no especial benefit will be discernible in car-repair costs.

On the other hand, the standard cars of the present day are likely themselves to become more or less obsolete within the next decade. The transportation art is still in its infancy, and it is likely to be generations more before really permanent standards can be adopted. Perhaps the chief benefit from the new standards will be the stimulus toward improving them; for on no account must the standards be so inforced as to prevent or hinder further development.

Maximum economy in transportation is the thing sought, and to obtain that, variety is as essential as uniformity. The Government has recognized this in ordering five different types of cars, with capacities ranging from 40 to 70 tons. Some roads use much heavier cars, many use lighter ones; and it remains to be seen how many additional standard types will be needed.

In the matter of locomotives, as previously pointed out, the situation is quite different. Each road has its special requirements as to lengths of divisions, ruling grades and the like, not to mention pusher grades or switching yards requiring very special types of engines. Perhaps the Government has met the situation by specifying 12 different types in the 1025 locomotives ordered. It is to be hoped, however, that the administration will not turn a deaf ear to pleas, if made, that none of the 12 types is adaptable to conditions obtaining at certain points or in certain districts.

It is true that much of the variation in locomotive and car design has been due to various degrees of mental inertia and to fondness for fads on the part of railway officers and equipment builders. It would undoubtedly be possible to improve standards of design by bringing together the most able engineering talent and giving it plenty of time and money to develop standards well in advance of any now in use; but standards which are merely an attempt to represent the best average design of the present day should not be so enforced as to hinder progress.

Engineer Officers for Infantry Regiments

IT IS a trite saying that this is a war of engineering. Everybody recognizes this fact theoretically; but we have not yet applied it practically by reorganizing the army for the work it has to do. We still adhere to the old plan under which the bulk of the army was designated as combatant troops and the work of building and maintaining intrenchments, roads and railways was delegated to certain specially selected and specially trained "non-combatant" engineer troops.

It is true that because of the conditions under which the present war is being waged the proportion of engineer troops has been very largely increased and a great amount of specialization has beeen undertaken. It has not yet been recognized, however, that for a large percentage of the time, infantry regiments should be engaged in the work of construction and transportation which was formerly delegated to engineer troops, and that in consequence the infantry regiments should be trained and directed in the performance of such work as unloading materials, digging trenches, getting mired trucks out of the mud, and performing simple rigging by specialists in construction methods.

It is time for us squarely to face the fact that winning the war depends more on superiority in the work of construction and demolition and in the operation of efficient transportation lines than on the actual fighting. The infantryman should be as capable with a pick and shovel as with a rifle or machine gun.

A proposal which is now being urged on the attention of the army authorities is that in the organization of the infantry forces there should be provided in every company, battalion and regiment a certain proportion of noncommissioned and commissioned officers to take charge of and instruct the men under them in military engineering. There will be plenty of work left for all the special engineer regiments which have been and are being organized. They will all be needed for tasks requiring special technical skill; but for the great bulk of the construction work—the building of roads, railways, trenches, and emplacements—there should be a sufficient number of skilled men available to direct the infantry soldiers and enable them to work with efficiency.

The United States is in a more favorable position to furnish men of this class than any other nation. It has a larger number of men who have had experience in construction work. There are, without doubt, thousands of such men in the engineer regiments already organized. These men are doing the work of privates; they should be attached as commissioned or noncommissioned officers to infantry regiments and set to work instructing the soldiers in the simper methods of construction which they will be called on to per-

form. To contend that any officer can get results out of a labor crew, on either skilled or unskilled work, is to say that the construction man is no better on construction work than the lawyer or the business man.

It is estimated that in order to give proper construction leadership to infantry regiments there will be required about 6000 commissioned and 15,000 noncommissioned officers to each million privates. There should be no difficulty in obtaining this number of competent men, partly from the engineer troops already mobilized, partly by selecting the men brought into the service through the draft who have had construction experience, and partly by bringing in men past the draft age who are competent to assume such positions.

Leading American engineers are urging on the attention of the highest officers of the Government a reorganization of the army on the lines above suggested. It is to be hoped that their efforts may be successful.

A Fair Question for Engineers

HIGHWAY transportation, says the New York *Evening Mail*, needs leadership and organization. Where are they to be procured?

A fair question for the daily press to ask the engineer. The *Evening Mail* put it at the end of a prominently displayed editorial the reading of which would broaden thinking—even among engineers—on this subject. Asserting that trucking costs as much in the aggregate as railway transportation, and that perhaps 60 per cent. of this is waste, the editorial characterizes as half-way measures the establishment of store-door deliveries and of return-load bureaus, and advocates a national solution of the problem through an express corporation similar in organization to the American Telephone & Telegraph Co. As many engineers know, this is the kind of organization in which the central company holds 51 per cent. of the stock of each local company, the remaining control of the branch organization in each locality being in the hands of resident interests. This type of organization combines national leadership in meeting the large problems with local control of details.

The presentation of this proposal is startling, both in its grasp of present transportation problems and its reach of imagination. The idea is a challenge to the engineer. Can a national corporation of this sort organize effectively our trucking and highway transportation interests? Can it coöperate in road and street construction and maintenance—the great task of determining, building and keeping up the best types of roads to carry the traffic?

These questions can be answered only by engineering analysis. They must be answered in the affirmative before assent can be given to the broad proposition put forth by the *Evening Mail*. If study should compel the engineer to answer in the negative either of the questions, it would be a foregone conclusion that such a national trucking company could not succeed in producing the most desirable results.

The railroads locate, design, build and maintain the tracks over which their traffic passes. The street railways and the telephone companies do likewise, asking no more of the cities in which they operate than permission to use the space required for the most efficient service. A forwarding company under national control would be handicapped in every locality by varying ideas as to what kind of track should be provided for its traffic, what loads should be permitted, how the track should be maintained and how the maintenance bills should be paid.

In fact, the analysis of road construction and maintenance has not proceeded to the point where it is known what are the most economical loads, what the proper motor-truck speeds for city and country, what the most economical types of roads under each of the classes into which motor-truck traffic will divide itself.

Would it not be best, therefore, to proceed with store-door deliveries, return-loads bureaus, investigations of the cost and scope of motor-truck transportation, studies of economical road types, and to work out the solution of these and other perplexing problems, before attempting to say to what extent the control of motor traffic in this country should be centralized?

The Office of Public Roads and engineers throughout the country are doing well to attack these questions. They can be answered none too soon.

Industrial Districts Need Unit Control

INDUSTRY is not concerned with minor political boundaries. When conditions are propitious, industrial districts will develop without reference to arbitrary city and state lines. In this country they have grown up in such numbers that their statistics have been made the subject of a special census bulletin.

New York harbor, the Delaware River district near Philadelphia, the Minneapolis & St. Paul "Midway" and the Pittsburgh steel mills are among the better known areas whose industrial population is bound together by commercial interests at least as strong as the claims of local governments controlling their separate parts. And yet in nearly all such districts proper development is hampered by a diversity of administration which subordinates to the good of the political divisions the benefit of the whole industrial area.

War is focusing attention on this problem as it is on others long of only academic interest. To speed up production minor conflicts of authority must be removed. In all industrial centers the questions of transportation and housing must be studied from something higher than a political viewpoint. Under forced draft the Federal Government is assuming authority and establishing a unity of control which waves aside local interest. Thus the new Port and Terminal Commission will doubtless make short work of the interstate feud which has long retarded the proper growth of New York harbor. Elsewhere, as along the Delaware River, efforts described on another page are being made to settle similar difficulties without resort to Federal control, which may terminate with the war.

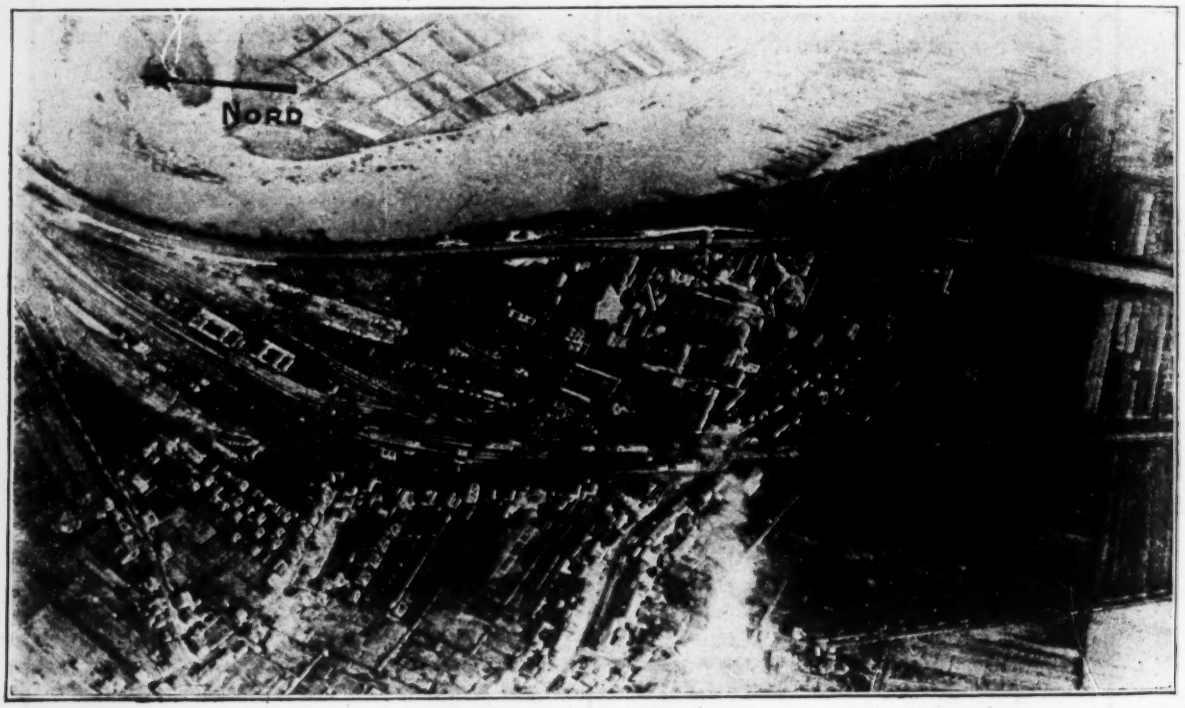
Whatever the present solution, the problem will remain with us. It is one on which engineers may well focus their attention, for while the essential difficulties are political, it is chiefly engineering problems which are affected by the present lack of coördination, and on the engineer will fall the responsibility of proving that any new system of control is superior to the old.

Army Topographical Division Co-ordinates Work of Map Makers in Air and on Ground

Existing French Maps Used as Basis for New Work—Aerial Photographs, Taken by Our Own Machines, Bring Valuable Data from Enemy Territory—Relief Maps a Specialized Work in Which U. S. Details Are Trained

By Robert K. Tomlin, Jr.
War Correspondent of Engineering News-Record

USING French army maps and civil records from various local sources as a basis, the topographical division of the intelligence section, American Expeditionary Forces, which has been passing through the organization and training stages for some months past, has been developed to a point where it is now furnishing to our staff and field officers in France maps on which the more recent information represents the work of American engineers; coöperating with them is our air service, which is responsible for the taking of all aërial photographs for map-making purposes. This statement I am in a position to make as the result of an interview at American Army headquarters with Col. A——, Corps of Engineers, U.S.A., commanding our topographical division. Its significance can be appreciated only when it is realized that the present war has revolutionized methods of map making, that a new art has been created, and that men, even though topographical specialists in civil life, must be put through an extended course of training before they can become useful in the new work at the front, which involves the taking and, of equal importance, the interpretation of aërial photographs. It has been this task, this rounding up of the technically qualified men, molding them into an engineer organization and training them in the various details of the service, that has occupied much of the time of the topographical division. But now the results of this preliminary work have begun to bear fruit, and week by week the scope of operations is being extended. Where formerly we were entirely dependent on the French Armies for maps of both sides of No Man's Land, we are, at this writing, drawing more and more upon our own resources for this information, and will continue to do so in larger measure as time goes on.



WHEN THE LENS IS NOT HORIZONTAL, CURIOUS EFFECTS FROM DISTORTION APPEAR
Height, 1700 meters—The river is the Moselle

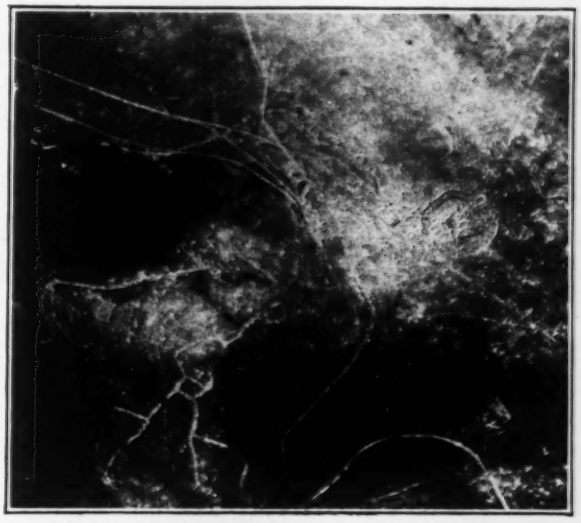
The topographical division must be able to furnish at quick notice maps of enemy ground and also that occupied by our own troops, the latter including not only the advance areas but also the territory in the rear, such as sites of supply bases, hospitals, aviation training stations, artillery and machine gun ranges, storage yards and camp areas. Obviously, it would be difficult, if not impossible, for a single detached organization to do the field and air work necessary for the production of all of these maps, especially on an extended front. The plan is, therefore, to have each Army map the territory along its own front, while the topographical division of the intelligence section, a headquarters unit, acts as the general clearing house for map informa-

tion, and outlines the broad questions of policy by which the special map-making forces in each Army are guided. Its work involves, of course, very close coöperation with the air service.

Fortunately, the American Expeditionary Forces have not had to start from the very beginning in the matter of maps. Those portions of the front which we are taking over have been completely mapped, as the result of more than three years' occupation by the Armies of our Allies, although the changing conditions on both sides of the line, involving the location of new field gun positions, roads, railways, and similar data of military importance, call for a large amount of work by our men. And it is pertinent to emphasize that our map-making forces must concern themselves with the sections of the rear as well as those of the front, and that while the aviator and observer with their photographic apparatus are now bringing back information from areas occupied by the German armies, engineer detachments, with transit, level, sketching-board and the rest of the equipment needed, are performing equally valuable service back of our lines and in other zones, at supply and ordnance bases, for example, where sizable cities must be created, at railroad yards, at artillery training grounds, and aviation fields.

Our topographical division's first work was a study of existing French maps. There is, to begin with, a set of maps with 20-m. contours, and drawn to a scale of 1 to 200,000. These maps, prepared by the *Service Géographique*, correspond in a general way to those issued by the United States Geological Survey. They are useful for certain military purposes, but obviously the scale is too small for detail work. For Army staff work the French use the *cartes d'état major*, maps on a scale of 1 to 80,000. There is a series of these maps covering the whole of France, and they give information of military value, such as the location of bridges, roads, railroads and canals. Topographical features, however, are shown by hachures instead of contour lines, the elevations of strategic points being indicated by lettering. There are also maps on a somewhat larger scale, 1 to 50,000, but these are merely enlargements of the *cartes d'état major*. In the vicinity of all fortified places special large-scale maps had been prepared by the French before the war. These maps contained a considerable amount of detail, such as the location of trenches, mines, etc.

Next in the list comes the *plan directeur*, on a scale of 1 to 20,000, equivalent, approximately, to 3 in. to the mile, which is, practically, the standard for use in every day field operations at the front. Existing sup plies of these maps, however, did not cover the training areas and our topographical division has been filling in the gaps by plotting the results of old French surveys which has never before been completed in the form of battle maps. For this work American engineers are using old civil records, such as those involving titles to land, and department tax maps, which correspond, in a general way, to those which would be on file in the office of a county surveyor in the United States. In connection with the work of making the new *plans directeurs* the American topographical division is also producing for special purposes a number of maps on still larger scales, 1 to 10,000 or about 6 in. to the mile,



A MUCH-BATTERED HILL—DOUAUMONT—2400 METERS

and even 1 to 5000, the latter, for infantry use, showing machine gun emplacements and practically every other detail along the front.

One of the first field operations which the topographical division of the American Expeditionary Forces carried out in France was the establishment of triangulation stations and the making of a network of traverses covering the zone of our army operations in the rear areas. To this task the division assigned picked men of its organization who had specialized in just this kind of work, many of them having held important posts in the United States Geological Survey and the United States Coast and Geodetic Survey. This triangulation work has been completed and is serving not only as a means of coördinating the individual large scale maps which are being produced, but also is of extreme value in the establishment of reference points for the guidance of our artillery fire.

Early in the war, when the fighting in France ceased to be in the open and developed into trench warfare, the conditions became, practically, those of a siege, and large-scale maps were in demand in numbers greater than had ever before been considered necessary. This state of affairs was responsible for the widespread production of the 1 to 20,000-scale map, this scale being now practically a standard on the French, British and American fronts. These 1 to 20,000-scale maps are known under different names, *plans directeurs* in the French armies, "trench maps" in the British, and "battle maps" in the American, but they are of practically the same type for all the armies. The contour interval is 5 m. Each map covers an area 20 x 16 km., and is divided into squares 1 km. on a side. These main grid lines are numbered for general reference, and a secondary system of coördinate numbers is applied to the 1-km. squares for the closer location work required by the artillery. It is not strictly accurate, by the way, to say that the grid lines form true squares, for they are actually projections, by the Lambert system, of imaginary north and south, and east and west lines on the ground. Due to the earth's curvature, the projection of the lines produces a slightly distorted "square."

TRENCH SYSTEM SHOWS PLAINLY AT 1900 METERS

The origin of the coördinate system applying to all of the *plans directeurs* is fixed at a point so that all horizontal map distances are measured toward the east, and all vertical distances toward the north. The same scheme applies to the indication of positions within the 1-km. squares where the southwest corner of the square is always the origin of coördinates. Thus, in reference to a gun emplacement by coördinates there are not both plus and minus numbers; all are plus. These *plans directeurs* show the position of the enemy trenches, but not our own, except on secret editions for our staff. They also indicate German battery locations, roads, etc.

In connection with the use by artillery of the *plans directeurs*, the topographical division furnishes the means for locating the position of each fieldpiece by means of reference points on the ground. These reference points are tied in to the permanent triangulation points. If any movement of batteries forward or backward occurs, the topographical division must see to it that new points of reference are quickly available. By their aid the battery commander can readily determine the coördinates for the position of each of his guns, and having been given similar data for his objectives behind the German lines, the setting of the proper ranges becomes a simple matter.

By far the most valuable source of information for making maps of forward areas is the aërial photograph. It is, however, a subject on which few details can be given. The work divides itself into three phases, the taking of the picture, its interpretation after development and reconstruction of the data in map form. Our topographical division has developed a force of specially trained men for the last two steps of this work, which calls for the highest type of technical skill, long experience and thorough familiarity with almost everything connected with modern warfare. To the uninitiated some of these pictures would be absolutely meaningless. Ofter the exposures are made at great heights, when machines are forced upward by anti-aircraft fire; conditions of light may be poor; the machine not be flying horizontally when the exposure is made, causing distortion in distances. In fact, scores of variable factors enter into the work, and the interpreter of photographs taken in the air must be a man of seasoned judgment, able to evaluate each streak or spot and discover its true meaning. His work is made doubly difficult by attempts to camouflage the positions of enemy guns. The photograph reader, therefore, must be a student of camouflage in all of its many variations. After a picture is made, no attempt is made to enlarge or reduce it to some uniform scale. It is put under lenses of high power, as well as stereoscopes, which bring the details out in relief, and the man who reads its message must be able to make the proper allowances for the height at which the exposure was made. The usual height for taking a picture from an airplane for map-making purposes, I was told, is 2500 meters.

In addition to its standard maps, the topographical division is called upon for many special maps, which must be prepared and issued quickly to staffs. Speed and accuracy are both essential. If an attack is being planned, for example, orders from headquarters must be illustrated by diagram maps. The topographical division, therefore, must be well supplied with all the map data which could be demanded, and must be ready to send it out at almost a moment's notice.

As to the accuracy of maps of enemy areas based largely on information from aërial photographs, the English and French, after the advance in the valley of the Somme was made, had an opportunity of checking their maps. I am told that the degree of accuracy discovered was, on the whole, very satisfactory, although the results of field surveys disclosed some points which needed revision. During a recent trip to the front I saw an enemy map which was found on the charred body of a German aviator who had been shot down behind the allied lines. Half of it had been burned away, but on what remained was plotted accurately in red ink the location of a light railway spur of one of our Allies which had been constructed only three days before the map was taken from the dead body of its owner.

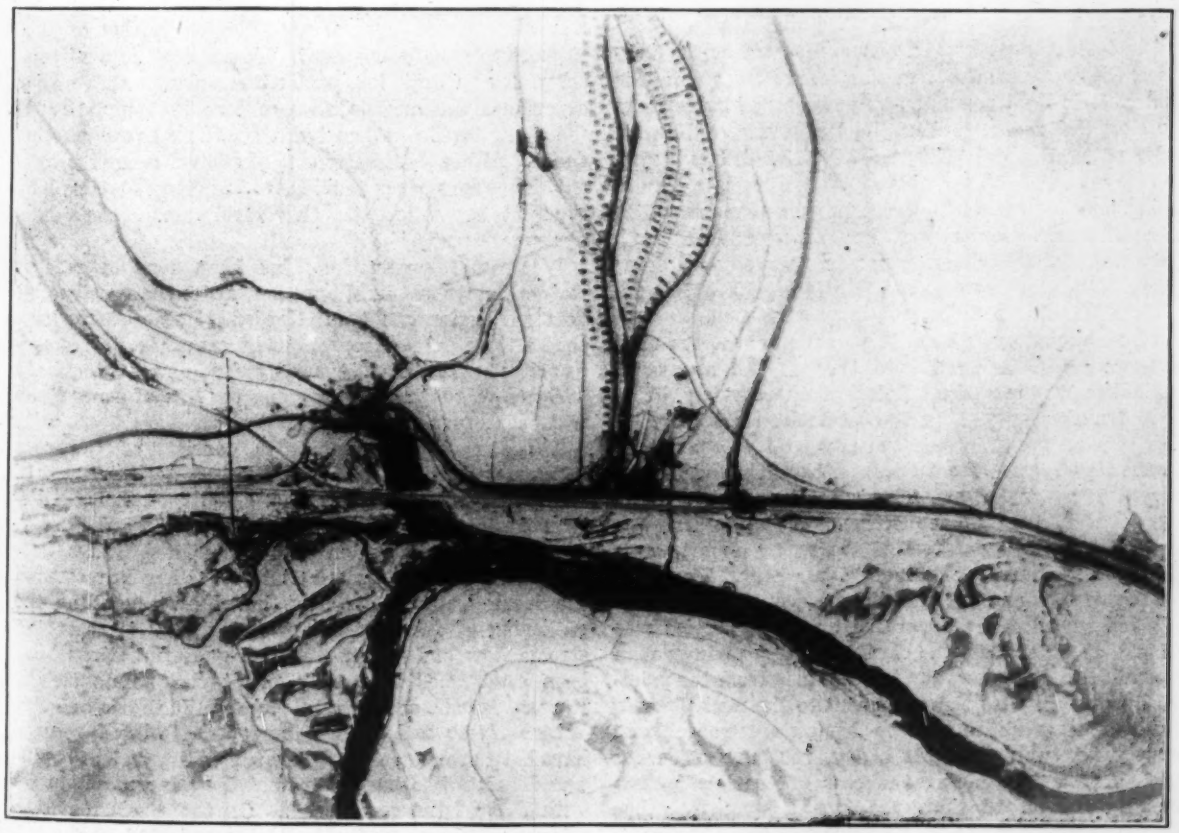
Having begun with the use of French maps, the American Expeditionary Forces have adopted the metric system for all of our topographical work. To change to

miles, instead of kilometers, at this date, would, it is believed, result in considerable confusion, especially as there are many situations demanding the interchange of maps between our own armies and those of our allies. Nevertheless, on our maps, in addition to the standard metric scale, is surprinted in red a scale in miles, and also a conversion table for metric and English linear measurements. French terminology also will be retained on new maps, although a glossary of terms is issued to facilitate their interpretation.

A tour of the "plant" of the topographical division at headquarters disclosed the work of map making in many of its phases. Leaving the offices of the chief of this service we went first to the filing room, in which is classified and stored a large stock of maps ready for immediate issue. An entire room was devoted to map storage, and piles of prints were arranged in rows on wooden shelves extending from floor to ceiling. Then we inspected the photo-lithography equipment, the printing presses, the gelatine process (used only when a limited number of copies is needed), the blueprinting machines, the drafting-room, the photographic copying apparatus and the various other features which the production of maps for use in war demands. By the gelatine process, which is patented, an impression is secured directly from a blueprint and transferred by inking the gelatine film and applying blank sheets over which a roller is passed. The gelatine process is employed extensively for color work, and especially for making over-prints—that is, adding new information to an existing map.

THE AIR CAMERA IS FLEXIBLY MOUNTED

One of the interesting sights in the topographical division was a collection of relief maps. They are used



HOW A RIVER, A RAILWAY JUNCTION, BILLETS AND FORTIFICATIONS APPEAR FROM 3200 METERS UP

to quite an extent in staff work, and a detachment of our forces has been sent to a shop in Paris to learn how to make these maps. One method is to mold them directly while the other involves the cutting up of copies of a map, mounted on cardboard, along every contour and the arrangement of these sections, one above the other, forming a series of steps. The angles of the steps are then filled with putty and a casting in plaster of paris is taken, giving a reverse relief map. A second casting, from the reverse, gives a true relief map, and over it a contour map is stretched and pasted down. The process is said to require a good deal of skill, as the application of the contour map to the casting involves the stretching of the map fabric (it looked like paper) over the mounds representing hills.

While the work of our topographical division is proceeding its personnel is gradually being enlarged, and many new men are now being instructed in the details of the several branches of this service. Every day sees changes on both sides of the front which must be recorded on maps. Thus the work of the division is a never-ending one, and its members must continually be on the alert in order to be ready night or day to supply our forces with maps that are both accurate and up-to-date.

Lawrence Thawed Services at Low Cost

ELECTRICITY was used to thaw some forty of about one hundred frozen water services at Lawrence, Kan., last winter. According to information supplied to *Engineering News-Record* by E. H. Dunmire, city engineer and superintendent of the water department of Lawrence, the department borrowed a transformer from the local electric light company, two resistance boxes from the electrical department of the University of Kansas, and purchased about 1200 ft. of No. 8 insulated wire. The services thawed varied from 25 to 100 ft. in length, taking an actual use of current in each case from 5 to 90 min. The full capacity of the transformer was used, connected to 2300-volt primary wires and stepped down to 110 volts. The amperage varied from 70 to 110, depending largely upon the length of wire used.

All equipment was placed in a wagon, which was used as a trailer to a small auto truck. The apparatus was taken to the nearest point of the services to be thawed and connected by the local electric light company's man. For the man the city paid 60c. per hour for the time required to connect to the wires and for the current 10c. per kw.-hr., with a minimum charge for current of $1 for each connection. The equipment was then left in charge of two of the water department's men, who were paid 35c. and 28c. per hour. They laid out the wire, connected it to the service, closed the circuit and guarded the apparatus until the service was thawed, at which time the electric light company's man was called to disconnect the transformer from the primary line and go with the equipment to the next place.

With this arrangement, the department was able to thaw about twelve services a day, not only rendering quick service but saving the cost of tearing up the streets in order to thaw the frozen pipes by other methods. The average cost of thawing the 40 services was about $3.25.

Kansas Flood Studies Prompted by Food and War Conditions

FLOOD losses in Kansas average about $4,000,000 a year. As the state is largely agricultural and these losses have a vital relation to food production and the war, the 1917 legislature created a State Water Commission to investigate floods and suggest possible remedies. From a somewhat lengthy paper on the work of the Commission, submitted recently to the Kansas Engineering Society, the following notes have been taken:

Broadly speaking, the rivers of Kansas have small minimum flows and heavy flood discharges. For example, the Blue and Republican Rivers are affected by severe summer rains and have shallow beds with rapid descent. The Marais des Cygnes and the Neosho are overhung with heavy growths of trees which fall into the streams and retard their flow, and their valleys and banks are low. Another source of danger is the congesting of river channels, especially in the cities, by bridges and other structures.

The mean annual rainfall in Kansas ranges from 37 in. in the east to 15 in. in the west. In the eastern third of the state, including the lower reaches of the rivers named, the mean rainfall during the crop-producing season is 25.97 in.; and generally 71 to 76% of the annual amount of rain falls during the season.

"Destructive floods," the report states, "have occurred so frequently, especially in some of the smaller watersheds, that the most optimistic farmers are disheartened. Unless constructive measures for protection are worked out the psychological effects of such failures are easily apparent. Tenants with small capital prefer to farm less productive uplands rather than experience the uncertainties of loss by inundation of the more fertile bottom lands by these ever-recurring floods. Although disastrous floods do not occur throughout the valleys every year, there are many places where the lands are so low that they rarely escape some damage every season."

Work on these problems has been done by various Federal, state and local agencies, and some constructive flood protection has been afforded. These efforts have shown the need for records of stream flow, for coördination of effort, and generally for a governing body with power to direct work along the line of some statewide conservation policy.

The state water commission consists of Governor Capper, ex officio, Prof. H. A. Rice of the University of Kansas School of Engineering, and Roger C. Rice, district engineer of the United States Geological Survey. Its work, in coöperation with the United States Geological Survey, the United States Weather Bureau, and the local drainage districts, has been to outline the gathering of data and to establish means of recording stream flow and weather. River-gaging stations have been established at twenty "strategic" points on the Kansas, Marais des Cygnes, Neosho, Verdigris and Arkansas rivers and their tributaries. Rainfall records have been provided for. The work of the various drainage districts has been coördinated as far as might be with that of the commission. On this basis the commission will request the legislature of 1918-19 for appropriations sufficient to make the program effective.

Local Topics Prominent Among Papers at Water-Works Convention

Those Presented Included General and Special Features of St. Louis Water-Works—Long Service of Savannah Artesian Wells—Three Types of Joints for Cast-Iron Pipes Tested

Special Features of St. Louis Water System

By W. A. Foley
St. Louis Water-Works

AMONG distinctive features of the St. Louis distribution system first mention may be made of the division of the city into a high-pressure district under 125 lb., and a low-pressure district under 85-lb. pressure. Each district is maintained independent of the other by means of separation valves, tabbed with numbered metallic disks.

These valves are not opened except when necessity arises, and in this event the high-pressure is allowed to bleed into the low-pressure system during the period the occasion demands. They are also opened during the semi-annual inspection of valves, which occurs in May and November, when all valves in the two systems are examined and worked to insure their thorough fitness for any subsequent operation, or as a relief to the high-service pumps, which occurs during the night, when a few separation valves are opened to relieve the load.

Another feature of the St. Louis distribution system is a 36-in. lock-bar steel main 26,700 ft. in length, which crosses the heart of the city, and acts as a carrier for either high or low-service feed. This feeder has its origin in the central pumping station and can be operated from an 85-lb. head with a delivery of 750,000 gal. per hour or from an 125-lb. head with a delivery of approximately 1,000,000 gal. per hour. The change in this trunk line from high to low service is effected by the operation of a few hand-operated valves immediately in front of the engine house and two hydraulically-operated valves at the terminus of the steel main, practically five miles distant, where it is breeched into both systems by means of a Y connection.

During the winter, when frozen soil conditions make the cost of excavation for repairs of broken mains excessive, the St. Louis department has found it practicable to use a blast pan, such as is employed by street repair gangs in asphalt surfacing. This proves an effective method of dissipating the frost and expedites the work of excavation, consequently effecting a saving of both time and labor.

In the repair of mains 15 in. in diameter and larger where such repairs necessitate the employment of a sleeve, the department finds it expedient to employ what is known as a sleeve-spacer. The spacer is a sort of turnbuckle affair, which is slipped into position and tightened, so as to prevent movement of pipe when the sleeve is slipped into space, but it serves an ideal purpose in spacing the sleeve so that an even joint can be run around the pipe circumference. Usually four of these spacers are employed in the repair of mains 30 in. in diameter and larger.

The St. Louis water department maintains a school of one week's duration twice a year. All employees of the distribution system attend, especially the newcomers, who are fully initiated in the art of cutting pipe, yarning and pouring joints, calking, assembling hydrants and valves, rigging derricks, the use and names of various tools, and all other little details with which all distribution employees should be familiar. These sessions are generally attended by department engineers, and often the exchange of ideas proves as beneficial to the superiors as to the subordinates. The professor in charge is generally a graduate of the ditch, who has advanced step by step in the service and is capable of showing the principle by actual demonstration.

Savannah Artesian Wells Have Done Quarter Century Service

By E. R. Conant
Chief Engineer of the City of Savannah

HAPHAZARD location of the river station group of artesian wells at Savannah, Ga., put in use in 1887-1889, resulted in a supply which soon became inadequate and led to the sinking of the Gwinnett group. The last-named artesian well system was designed by Thomas F. Johnson, Chicago. The 25 river wells were put down at random over an area of 10 acres. The 12 Gwinnett wells were sunk 300 ft. apart on a line at right angles to the direction of the subterranean flow. The Gwinnett wells have a diameter of 12 in., a depth of 500 to 600 ft. and are cased down into rock, some 250 ft. The wells are connected with a 6-ft. brick conduit 10 to 16 ft. below ground level, which discharges into a small well from which water is pumped directly to the distributing mains.

The first artesian wells in the Savannah district antedated the river station wells by five years. The water from these wells rose to from 30 to 35 ft. above mean low water. There are no early records of the static head in the river station wells but their diminution in yield indicates that the head was lowered 20 to 25 ft. within three years of the time they were put in use.

The Gwinnett wells are 3900 ft. from the river wells. When the first of these were sunk in 1890 their static head was about 28 ft. above mean low water. In 1893 the head was 12 ft. lower, and in 1898 it was 5 ft. lower still. There is no record of the head when the air lift was installed in 1902. In fact, the static head was not carefully determined until 1915, when the writer found it to be 10 to 12 ft. below mean low water—a drop of 22 ft. in 17 years, or an average drop of something less than 1½ ft. a year.

When the 12 wells at the Gwinnett station were put in use, in 1892, they yielded, by natural flow, 10,300,000 gal. a day. This fell to 9,500,000 gal. in a year or two;

to 5,500,000 gal. by 1895 and to 5,000,000 gal. in 1900, where it remained until the installation of the air lift in 1902. Tests made by the author in 1915 showed a daily yield of 15,000,000 gal. At present 8 of the 12 wells yield 10,000,000 gal. a day.

Water Treatment at St. Louis

By A. V. Graf
St. Louis Water-Works

VARIATIONS in the proportions of water coming from the Mississippi, Illinois and Missouri Rivers markedly affect the character of the water treated at the St. Louis water-works. The Illinois River enters the Mississippi 33 miles north of the intakes at the Chain of Rocks and in traversing this distance a more or less intimate mixture of the two waters is effected. The Missouri River enters the Mississippi 5½ miles north of the intakes and causes a pressing of the Mississippi River water upon the east bank of the river and in this way, as a rule, very little mixing of the two waters occurs by the time the water reaches our intakes.

The Mississippi River drainage area being covered with swamps, the water in this river becomes highly colored at times of heavy run-off, while the Illinois River, carrying a large amount of sewage, contains colloidal organic matter which seems to act as a protective colloid on the turbidity carried by this river. The water in the Missouri River, always turbid, becomes much more so at times of heavy run-off.

Two intakes are in use. The water drawn through the old or west intake is principally Missouri River water for the greater part of the year, while the water drawn through the new or east intake is a mixture of the Mississippi and Illinois River waters, although at times the water at both intakes is practically the same both chemically and physically. The east intake was in service only 97 days last year, whereas the west intake was used for 350 days. Because of the greater difficulty of treating the water from the east intake, this is not used unless low stages of the river or anchor ice, or both, affect the pumping.

Treatment begins at a grit chamber where the average velocity of flow, at a rate of pumping of 150,000,000 gal. per day, is only 0.33 ft. per second. More than 50% of the matter deposited passes a 100-mesh sieve. The tonnage of the matter removed by the grit chamber during the past year was 63,703, or 23% of the total suspended matter present in the water.

Leaving the grit chamber, the water flows through a short conduit to the mixing chamber, where milk of lime and a solution of sulphate of iron are added. The water then enters sedimentation basins, which remove 99% of the suspended matter. From these basins the water enters a collecting conduit and passes through two 8-ft. venturi meters and into a small secondary coagulation basin, connected to secondary sedimentation basins by stop-plank openings. A solution of sulphate of alumina is added at the throat of the meters and is automatically controlled so that the quantity added per unit is constant for any setting, regardless of fluctuations in the flow through the meters. No mixing chamber is provided here because of the low permissible loss of head, namely 1½ ft. The settled and coagulated water is passed through mechanical filters and then disinfected with liquid chlorine.

During the year which ended Feb. 28, 1918, the average daily rate of filtration was 85,390,000 gal. and the wash water averaged 1.56%. Other operating data are shown in the table following, and the variations in the water are shown in the table at the bottom of the page.

OPERATION RECORD FOR YEAR WHICH ENDED FEB. 28, 1918

	Chemicals Used	Grains per Gallon		
	Pounds	Maximum	Minimum	Average
Lime	30,147,933	8.00	4.00	5.371
Sulphate of iron	4,294,689	2.50	0.00	0.765
Sulphate of alumina (meters)	3,781,163	3.68	0.11	0.673
Sulphate of alumina (influent)	29,560	0.25	0.00	0.005
Sulphate of alumina (filters)	108,756	14 lb. per wash	0 lb. per wash	0.019 gr. per gal.
Chlorine	74,516	4 lb. per million gal.	0 lb. per million gal.	1.89 lb. per million gal.

St. Louis Has New 110,000,000-Gallon Pump

By L. A. Day
St. Louis Water-Works

DEMAND for more pumping capacity at the low-service pumping station of the city of St. Louis is being met by installing a turbine-driven centrifugal pump with a capacity ranging from 80,000,000 to 110,000,000 gal. in 24 hours against any head varying from 45 to 65 ft. This range of flexibility could not be met entirely with governor adjustment, but will be obtained by opening or closing hand-operated valves on the turbine. The speed of the unit thus obtained will be further controlled by an automatic governor. This governor will be of the oil relay type, designed to permit of adjustment while the unit is in operation to any point within the required range of speed, and after being adjusted will maintain the required speed within 2% variation above or below.

The maximum brake horsepower of the turbine will be 1550 and the maximum water horsepower required, including all pipe friction, will be 1250; the speed of the turbine under these conditions will be 3717 r.p.m. When the pump is delivering 80,000,000 gal. of water in 24 hours under a total head of 45 ft. the turbine will run at 2946 r.p.m. The pump speed will be lowered by means of reduction gears to 352 r.p.m. when delivering

VARIATIONS IN WATER AT ST. LOUIS

Description	River Water			Settled Water			Applied Water			Water to H.S. Pumps		
	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
Stage of river	105	74.9	78.4	.....	..	.....	.....	..	.....	...	...	.....
Temperature	84	32	54	.....	..	.....	.....	..	.....	...	...	.....
Turbidity, p.p.m.	5,000	8	1,240	110	9	24	32	4	10	0	0	0
Color, p.p.m.	48	10	22	35	6	14	32	5	12	28	4	9
Suspended solids, p.p.m.	6,930	6	1,700	.....	..	.....	.....	..	.....	0	00	0
Dissolved solids, p.p.m.	468	190	310	.....	..	.....	.....	..	.....	370	150	215
Total solids, p.p.m.	7,210	400	2,010	.....	..	.....	.....	..	.....	370	150	215
Alkalinity total, p.p.m.	233	93	145	146	32	60	136	27	56	127	26	53
Alkalinity caustic, p.p.m.	.....	.....	.....	8	..	.....	.....	..	.....	...	...	.....
Alkalinity bicarbonate, p.p.m.	233	93	145	122	..	20	120	0	28	115	8	29
Hardness total, p.p.m.	304	116	193	.....	..	.....	.....	..	.....	188	66	108
Bacteria (gelatine), per cu.c.	625,000	600	55,500	7,000	59	1,020	4,800	53	710	530	2	98
Bacteria (agar), per cu.c.	27,000	110	7,300	450	15	97	290	9	57	57	2	11
Coli, per cu.c.	80	0.2	17.2	.....	..	0.259	.....	..	0.271	...	...	0.0106

110,000,000 gal. under 65-ft. head, and to 279 r.p.m. when delivering 80,000,000 gal. under a 45-ft. head. The guaranteed pump efficiency will be slightly above 80% under all of the specified head and capacity conditions. The suction and discharge openings to the pump will be 48 in. and the 60-in. suction and discharge piping will be gradually reduced near the pumps to this diameter.

The turbine is of the multistage impulse type and will operate with 125 lb. gage pressure and 75° superheat. Provision will be made for bleeding 1500 lb. of steam from one of the low-pressure stages for heating feed water. Bleeding this amount of steam will increase the B.t.u. duty of the unit approximately 3 per cent.

The unit was bought on the bidder's guarantees of duty per million B.t.u. consumed by the unit, including auxiliaries and bled steam, with the provision that the total amount of exhaust steam from the auxiliaries, plus the steam bled from the unit, should not exceed 2200 lb. per hour. The successful bidder's guarantees were as follows:

	100,000,000 gal.			80,000,000 gal.			110,000,000 gal.		
Head in feet	45	60	65	45	60	65	45	60	65
50° circulating water	113.5	120	122	107.0	113.75	115.0	114	120.75	121.5
80° circulating water	106.5	113	115	101.5	108.50	109.5	107	113.50	114.0

The average duty for all of these conditions is 114,562,000 ft.-lb. per million B.t.u.'s, which is equivalent to a duty of 134,000,000 ft.-lb. per 1000 lb. of steam.

Tests of Cement, Lead and Metalium Joints for Cast-Iron Pipe

By Prof. Fredfric Bass, University of Minnesota and J. A. Jensen, Minneapolis Water-Works

More extensive use of cement joints for cast-iron pipe, especially at a time when lead is so costly, is indicated by recent tests made by the writers at the engineering laboratory of the University of Minnesota, the university and the city coöperating.

Four lengths each of standard cast-iron pipe, supported and connected as shown by the diagram, were tested. For the cement and metalium joints, 8-in. pipe and for the lead joints, 6-in. pipe were used, sufficient 8-in. not being available.

The lead joint was made in the customary manner.

The cement joint was made of portland cement, mixed rather dry. The bell of the pipe was cleaned and a dry packing inserted. The inner half of the bell was filled and calked with a blunt calking tool without using a hammer. The outer half was filled with the same mixture and calked with a hammer. A slightly wetter cement bead was immediately placed on the joint. The joint was kept covered with wet cloth for one week.

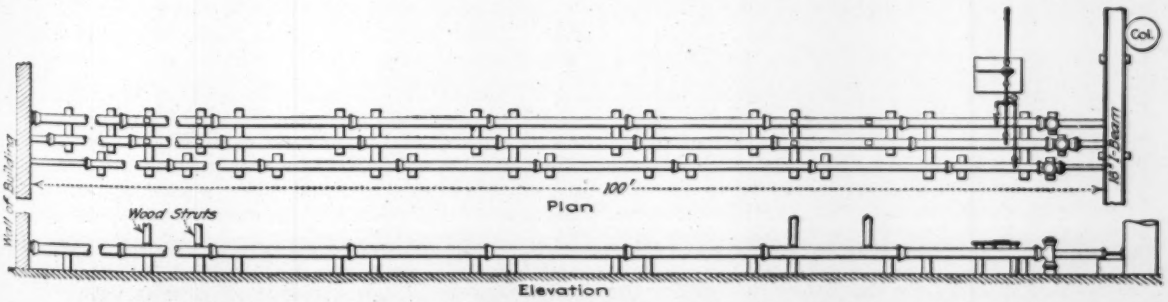
The metalium joint was poured in the usual manner and not calked, and the material cannot be calked. Metalium is a patented material manufactured by the Metalium Refining Co., Omaha, Neb. It is manufactured in the form of small pellets about the size of buckshot. In heating and melting, a temperature of from 250° F. to 300° F. was used. It was found that if a higher temperature was used the material thickened so as not to pour readily. It rapidly sets in place with a considerable loss in volume.

In the 8-in. joints about 3.5 lb. of cement and 3.5 lb. of metalium were used. In the 6-in. joints, about 11.5 lb. of lead were employed.

The water was allowed to fill the pipes after the initial set of the cement. Four days after the joints were made the water was let into the pipes under city pressure (75 lb. per square inch). At this time a test of the lead joint was made. The pressure was pumped up to 600 lb. per square inch without any visible result. The supports from the four middle lengths were removed and the pipe was deflected at the center about 12 in., three joints opening, the middle joint to a very considerable extent, causing large leakage. These joints were then recalked and remained tight at 600 lb. per square inch pressure.

The cement and metalium joints were tested 30 days after laying, and during this period the city pressure was kept on the pipes. The cement joints sweated slightly at first, the water which appeared on the surface evaporating. This soon disappeared and the joints, with the exception of one, became tight and dry. The wet joint was the first one put in. It was made with less water in the mixture than were the other joints. Ten days after laying, a water pressure of 250 lb. per square inch was temporarily put on the cement joints, without visible result. During the 30 days, the metalium joints all leaked, considerably at first, but less and less as the material of the joint became filled or expanded. The leakage at the end of 30 days under the city pressure of 75 lb. per square inch was at the rate of 260 gal. per mile of pipe (440 joints per mile).

At the time of the test, the pressure was simultaneously increased on both pipes. It was held at 200 lb. per square inch and the leakage of the metalium



THE THREE LINES OF PIPE WERE SUPPORTED ON WOOD BLOCKS AND BRACED AT EACH END

joint was measured and found to have increased to a rate of 450 gal. per mile. No leakage from the cement joints was observed. The pressure was then increased to 300 lb. per square inch and the leakage from the metalium joints increased to a rate of 4640 gal. per mile. The cement joints still showed no leakage. The pressure was again increased, but owing to leakage it could not be raised over 375 lb. per square inch. The leakage was entirely from the metalium joints, the cement joints showing no leakage, but faint, radial hair cracks appeared in the upper third of the circumference on the cement bead. Later it was found that these cracks did not show in the joint itself.

The supports from the two middle pipe lengths was then removed (the pressure being maintained at 300 lb. per square inch) and both pipes deflected ⅜ in. at the middle joint. The supports were then removed from the next two pipes in both lines and the deflection amounted to 3 (±¼ in). At this point two cement joints opened slightly, drops of water falling at intervals of about 10 sec. from each. The other cement joints remained tight. A load of iron of 850 lb. was then put across the middle of the two pipes, being equally divided between them. This caused the cement-jointed pipe to settle an additional ¼ in. and the metalium jointed pipe to settle an additional 1½ inch.

It would seem from these tests that cement is a material which should be used for cast-iron water pipe except under the heavy pressures used for high-pressure fire service, or possibly under a fill where extreme settlement caused by a heavy filling, greater than that superimposed in this test, would cause a much more severe bending load to be applied. A saving of from 5 to 8% of the total cost of an 8-in. pipe laid in an 8-ft. trench is apparent in the use of cement.

In all the joints here described, the joints were made by experienced men, but possibly special care in handling the metalium was absent.

Double 48-Inch Pump Manifold at St. Louis

By C. M. Daily
St. Louis Water-Works

By-pass connections, to permit any one of five pumps at the Bissell's Point pumping station, St. Louis, to deliver at will into either one of two force mains leading to different water-service districts, are being provided by means of a double 48-in. manifold placed in a reinforced-concrete chamber. This makes it possible to provide increased capacity at Bissell's Point for the district formerly served from the Baden station.

The manifold is composed of two parallel 48-in. flanged cast-iron pipes 94 ft. long, spaced 12 ft. apart in a vertical plane and erected at right angles to the 36-in. mains from the pumping station. Each force main will be connected to both the upper and the lower manifold in a vertical plane by means of a Y-branch introduced into the main about 20 ft. from the manifold. Each branch of each main will have a hydraulically operated gate valve inside the concrete chamber. These valves will be operated from the station, permitting the engineer to pump, at will, into the 85- or 125-lb. force main. Three hand-operated and two hydraulic 36-in. valves are placed on the pump mains leaving the manifold, and four hand-operated 48-in. valves placed in the manifold are for the purpose of withdrawing part of the system for any repairs or inspection that may be necessary.

The manifolds are supported on steel I-beams, incased in concrete for protection, which rest on the side walls of the chamber. The chamber, whose top will be flush with the ground at the center, is 102 ft. long, 20 ft. 4 in. wide and 18 ft. 8 in. deep, all inside dimensions. The bottom is designed to distribute the weight of the chamber and manifold over the entire area, the side walls to act as a vertical beam designed to withstand water pressure on the outside or one-half that pressure on the inside; horizontal beams at the top of the wall transfer the reaction of the wall to struts or ties across the top. The struts of the tie-beams act also as roof girders, on which rest removable reinforced roof beams which support the removable roof slab.

Los Angeles Water-Works Grow

A daily average consumption of about 20,000,000 gal. from the aqueduct has been used by the City of Los Angeles in the past year, according to a statement recently made by William Mulholland, chief engineer, Bureau of Water-Works and Supply. In addition to this, 50,000,000 gal. daily have been supplied this year from the old source. The old source was outgrown in 1914, since which time water from the aqueduct in increasing quantities has been used for domestic purposes. The surplus water of the aqueduct (which amounted during the past summer to 150,000,000 gal. daily over and above the requirements for domestic consumption) was used for irrigation purposes in the recently annexed territory of the San Fernando Valley, which is now a part of the city. "In disposing of its surplus water the city deals exclusively with individual farmers, nearly all of whom have domestic services in addition to the larger services used for irrigation," said Mr. Mulholland.

The total length of the city's distributing pipe lines and mains of 2 in. or over, but exclusive of the 233 miles comprising the aqueduct, now amounts to 1610 miles, compared with 337 miles in 1902. In the fiscal year that ended June 30 the city added to the system 310 miles of water pipe, 262 miles of which were new mains in the San Fernando Valley. The outlay for the San Fernando pipe system was approximately $3,000,000, which was defrayed by the lands improved.

Los Angeles now ranks fourth among the cities of the United States in pipe mileage, Mr. Mulholland states. In 15 years the city's water services have increased from 23,000 to 108,783. The bonds issued by the city water-works system, exclusive of aqueduct bond issues, amount to approximately $2,500,000. The physical valuation of the Los Angeles river system and the city distributing system at the present time, allowing deduction for depreciation, is $12,535,000. All charges on the $2,500,000 have been met out of water revenues and the same source of income has provided for the extensions and improvements that have been made. Water rates now are considerably less than half what they were under private ownership.

How Progress Is Recorded on Army Construction Jobs

Construction Division Has Standardized System By Which Project Heads Report Weekly To Washington Office

LAST summer the cantonment division of the quartermaster corps, United States Army (now the construction division, United States Army) had to devise in quick time a standard method of reporting to the home office at Washington the progress made on the various construction jobs, mostly cantonments, that were going on in several parts of the country. From the experience gained at that time, the division has developed a method of report which is followed on all of the many different types of construction work now under the direction of the Army. They include not only the usual buildings in army camps and posts, but also a great amount of dock, harbor and terminal work, together with large warehouses.

The constructing quartermaster, who is the army officer in charge of each job, is required to compile, at the end of working hours on each Saturday, four weekly reports to be forwarded to Washington. These are:

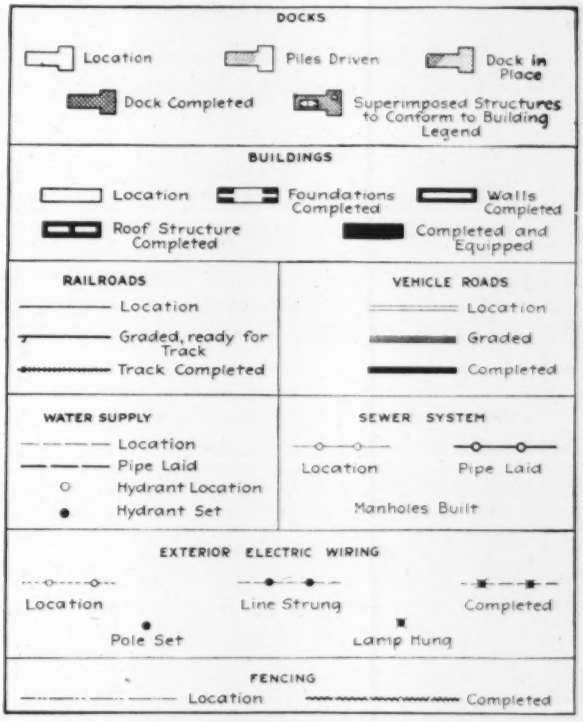
1. A progress form showing the physical condition of the work as a whole; (2) a graphical diagram showing by percentages the rate of progress of each feature of construction; (3) a material statement showing graphically the ideal rate at which each of the principal materials should be received and the actual rate, week by week, up to that time, at which they have been received; (4) a supplementary report, mostly on labor.

The first of these, the progress plan, has to be drawn to a suitable scale, and includes all the units of the project and all the features of construction. Each structure is designated by a number and a key letter, so that it may be readily segregated and identified in correspondence. The tracing of the progress plan is prepared and retained in the office of the constructing quartermaster, who must keep it posted to date with respect to progress and to changes in location of structure. For purposes of classification all work is divided into twelve subdivisions: (1) Masonry buildings; (2) wood building; (3) docks; (4) railroads: (5) vehicle roads; (6) water supply; (7) sewer system; (8) concrete construction other than buildings; (9) excavation, filling and grading; (10) dredging; (11) outside electric wiring; and (12) fencing.

Such of these as can be indicated on a drawing have a standardized legend showing the progress made. This legend is shown in the drawing in the present article.

The graphical diagram required has to indicate the percentage of work completed at any given time. In this diagram ordinates are laid off on the scale 100% equals 5 in. and abscissas to a scale of four weeks equals 1 in. In addition to a curve of actual progress, there is on each of the diagrams a line to represent an ideal uniform progress from the beginning of the construction to an established date for its completion. The actual time occupied in performing the work of the central component parts of the structure is to be used as a basis for determining the percentage of completion in a given period.

It is assumed in the cases of framed structures that



Legends indicate how construction progress is plotted on master drawing by army constructing quartermasters

the time is proportional to quantities of feet b.m. erected and placed; that for excavation, filling, grading, dredging, and concrete construction other than building, the time is proportional to cubic yards of material actually handled or complete in place, as the case may be. The time required for erecting fencing is proportional to the number of linear feet erected. In the case of all other types of construction, the several features are weighted in respect to the time required for their completion in the following proportions:

I—Masonry Buildings:

	Percentage
1. Foundations of piles, concrete or embankment	25
2. Terra cotta work	12
3. Timber construction, including roof trusses and purlins	18
4. Roofing	11
5. Concrete floor and loading platforms	22
6. Windows and doors	7
7. Fixtures and equipment	5

II—Wood Buildings:

	Store Houses and Quarters	Lavatories	Stable
1. Foot B.M. in structure	67	30	80
2. Plumbing	7	55	
3. Windows and doors	22	12	17
4. Fixtures and equipment	4	3	3

III—Docks:

	Percentage
1. Piling	80
2. Capping and bracing	10
3. Decking	10

IV—Railroads:

	Percentage
1. Ballasting	75
2. Track laying and special work	25

V—Vehicle roads:

	Plank	Asphalt	Brick	Concrete	Macadam
1. Preparation and base structure.	10	80	50	10	60
2. Surface.	90	20	50	90	40

VI—Water Supply:

	Percentage
1. Trench, excavation	80
2. Pipe laying	10
3. Backfilling	5
4. Hydrants and fixtures	5

The material statement required is also in the form of a diagram made up of 12 cross-section squares, each

representing one of the 12 principal materials needed on the work. In these squares the ordinates represent the amount or percentage of delivery and the abscissas the time. On each of the squares is drawn a curve indicating the rate at which the material should arrive. This rate is determined from a carefully thought out program made at the start of the project. Along with it is plotted the actual rate of arrival of the material during the progress of the work.

The supplementary report, a facsimile of which is appearing herewith, must state the average number of men employed during the period covered, classified according to work performed. These reports set forth in addition the labor expenditure, the expenditure previously reported, and the expenditure to date, an explanation of delays in construction or receipt of material, the condition of the weather for each day and any suggestions for expediting construction.

Cantonment Division
4 - Supplementary Report

Project _____ Week ending _____

Class of Labor	NUMBER OF MEN EMPLOYED						
	Thurs.	Fri.	Sat.	Sun.	Mon.	Tues.	Wed.
Blacksmiths							
Bricklayers							
Carpenters							
Cement Workers							
Chauffers							
Electrical Workers							
Engineers							
Firemen							
Glazers							
Laborers							
Machinists							
Masons							
Mechanics							
Office Men							
Painters							
Pile Driving Crews							
Pipe Layers							
Plumbers							
Riggers							
Roofers							
Sheet Metal Workers							
Steamfitters							
Steam Shovel Workers							
Teamsters							
Train Crew							
Watchmen							
Waterboys							

(OVER)

Summary

	Daily Labor Totals	Daily Labor Expenditures			
Thursday			Labor Expenditures Previously Reported	Total Labor Expenditures To Date	
Friday					
Saturday					
Sunday					
Monday					
Tuesday					
Wednesday					
Total					

Date	Delays in Construction or Receipt of Material	Weather A.M.	Weather P.M.	Temperature A.M.	Temperature P.M.

Comments and Suggestions:

_____
Constructing Quartermaster

Face and reverse of 8¼ x 10½ in. supplementary report required by constructing quartermasters

War Shows Central Control Needed in Industrial District

Delaware River Territory from Wilmington to Trenton Should Have Unity of Planning in Transportation and Housing

EXTRA-MUNICIPAL or even interstate control in industrial districts, so far as the planning of future Governmental and public utility development is concerned, is a possibility brought by the war to that large and prosperous territory lying on both sides of the Delaware River some thirty miles on either side of Philadelphia. For many years this district has been among our foremost industrial centers. Natural advantages in the way of both water and rail transportation gave an early impetus to the growth of all manner of factories, but during the past three years the manifold activities of war production have produced on the Delaware an unprecedented growth. Shipyards, munition factories, engine and machinery plants, every kind of present day forced production, dot the river all the way from Wilmington to Trenton and extend back through the territory controlled by the paralleling railways.

Each of these plants has grown up as a unit with little relation to the others. Naturally, the railroad development has kept pace with the industries because the railroads had an eager eye toward the development of business throughout the whole area. Nothing else, however, has had any unity of control except the river channel itself, which is under Federal administration. The most important part of river transportation—that is, the design and development of harbors and terminals—has been left to the individual plants or, in the cases of the cities, to the separate administrations of the municipalities.

Now the district is being considered as a whole, particularly in regard to its transportation facilities, other than rail, and to housing requirements. The plants concerned lie in three states, Delaware, New Jersey and Pennsylvania, but mainly in Pennsylvania. A large part of the Pennsylvania activities are in the confines of the city of Philadelphia, but that city no longer contains the great plants which have stretched out to the north and the south along the river and railroads. There is, then, no central body which can envisage the problem as a whole and which can plan for its solution.

Efforts were made a few years ago to establish a central industrial district in the area in the State of Pennsylvania included in a radius of twenty-five miles from Philadelphia. In fact, such a district was created by the legislature, but as no funds were provided by the same act it lapsed without performing any duties. A similar but more powerful commission is now under considera-

tion, and it is understood that there is a fair chance of such a commission being authorized by the Pennsylvania legislature. A second possibility for the control of a large part of the district is a movement to increase the authority and boundaries of the city of Philadelphia to include a large number of outlying towns. These two are official projects which may be authorized in the State of Pennsylvania. Besides them there are two agencies at work studying the prospects of control. One is the Comprehensive Plan Committee of the city of Philadelphia, which has certain powers within the city and which assumes to have other recommendatory powers in the outlying municipalities. The other body working on the problem is the Philadelphia chapter of the American Institute of Architects. The local architects were brought into the problem by their individual interests in the housing schemes for the industries. From that they developed a more or less comprehensive scheme for the transportation and the housing control of the district; this they have submitted to the various official bodies concerned with the matter.

The eventual solution of the whole problem involves three items, roads, ports and harbors and housing. The road problem is at present the most pressing. Intercommunication between the plants lying on all sides of Philadelphia is more and more being made with motor trucks, but good highways for such transportation are altogether too few, and for the most part lead directly through the city of Philadelphia. Connection between Chester and Bristol, for instance, lying about the same distance to the south and north of Philadelphia, is at present made on roads traversing the busiest section of Philadelphia. Parts of the new scheme for the development of the territory provide for new roads or the improvement of old ones, allowing such trucks to go past Philadelphia with the least part of the route in the congested parts. Such roads also are to be tied into main highways leading to such large industrial centers as Steelton, Reading and Bethlehem, all lying to the north of Philadelphia.

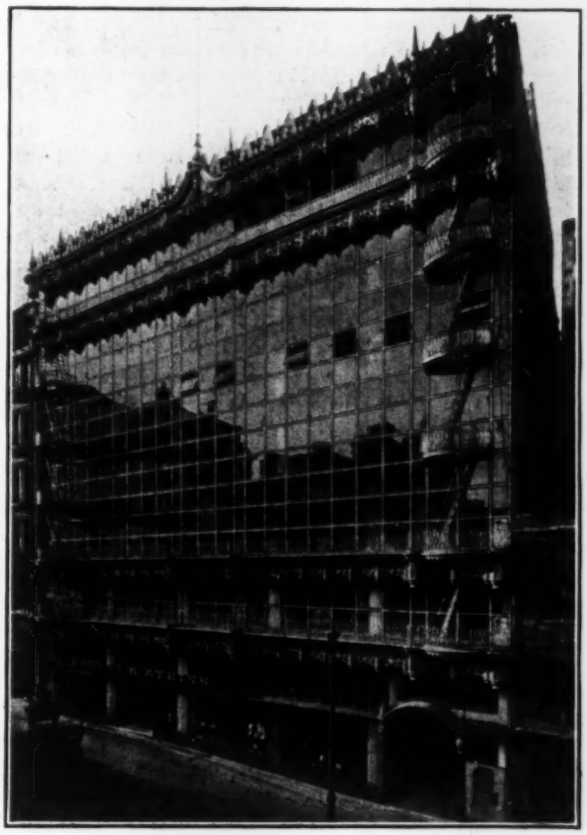
The Delaware River is in admirable condition for river transportation. On the other hand, the ports on the river, with the exception of Philadelphia, are anything but acceptable. It will be a part of the centralized scheming for the district at least to recommend port developments in the smaller cities, so that such developments can be coördinated with the rail and road communications to the interior and so that the proper balance will be preserved between the river ports.

Housing is pretty largely a local problem, although the almost continuous line of plants along the river make it in many cases a problem of local transportation. A centrally controlled body might find, for instance, that it would be more desirable for the district as a whole to establish new communities some distance back from the river and connect them by street railways to the industrial centers. The municipal administration governing any one of these centers would not be likely to reach such a solution, although it might be the best for all concerned.

At present nothing has been definitely done toward establishing this new type of control of an industrial district, but it is among the possibilities that if the citizens and local bodies do not themselves come to some such solution of their difficulties the Federal Government, which in the present crisis is so vitally concerned with the productive capacities of the Delaware River district, may have to step in and establish some sort of control.

Offsets from Columns Permit Glass Front to San Francisco Building

THE entire front of the Hallidie Building, recently completed in San Francisco, is made of glass. The idea was to utilize as much of the area as possible for lighting and by a special arrangement of columns and floor slabs the effective front was kept near to 100%. The building is a reinforced-concrete structure 117 by 103 ft. in plan, the all-glass side facing south. On the north side a high percentage of the building front is utilized for lighting, and no windows are provided on the east or west side. The upper floors are to be used for loft purposes.



BUILDING HAS A FRONT ENTIRELY OF GLASS

The ceiling heights are about 12 ft., and by making the sashes slightly less than 4 ft. square three tiers of sashes could be put on each floor. Every sash can be swung about a central horizontal axis. The columns are set back 3 ft. from the plane of the glass and after having been painted blue can hardly be seen from the street. The floors between columns and glass are raised 18 in. higher than the main floor, forming a sort of bench, along the windows, supported on steel cantilever

beams. This floor is made sufficiently strong with a slab much thinner than the main floor slabs. Thus, the effective ceiling height at the windows on each floor is increased, to the great improvement of the lighting.

The cost of the all-glass front is said to have been practically the same as in the ordinary type of loft building construction. With its blue and gold decoration, the all-glass facade of the building has attracted much attention. Willis Polk, San Francisco, is the architect.

Hydro-Electric Plant Installed to Utilize Waste Energy

A 5500-HP. unit has recently been put in service by the Pacific Gas & Electric Co., just below the Lake Spaulding dam in California, used to store water for a chain of hydro-electric plants below. The new unit is situated in an excavation in solid rock which is an enlargement of an adit used when the tunnel outlet from the reservoir was being excavated. After the tunnel had been driven the necessary bypass valves, nozzle approaches and draft tubes were set in place where the adit meets the tunnel, in anticipation of the later installation of power equipment.

The arrangement of the conduit is such that the flow can be diverted through the waterwheel and returned again to the tunnel. From this point on the tunnel is built on hydraulic gradient so that all energy stored in the water may be used in passing through the unit. Relief valves provide a bypass around the waterwheel which is used when water is to be delivered through the tunnel without going through the turbine. The head of the unit will vary from almost nothing up to a maximum of 234 feet.

The wide range in head made it difficult to decide upon the design of turbine runner to be installed. A unit with interchangeable runners, one for the higher heads and another for lower heads, was at first contemplated. In the war-time emergency need for increased power and with the delayed deliveries now being quoted, original plans were revised. It was found that a 5000-hp. unit designed for the Pacific Power & Light Co. of Portland, Ore., but not now required by that company, could be purchased under terms of immediate delivery. As this unit met very closely the requirements at the Lake Spaulding plant, it was forthwith purchased and installed.

The cavern in the granite rock had been excavated for a horizontal shaft unit, but the unit purchased had a vertical shaft which required considerable more headroom. Blasting in the hard granite close to the control valves was not permissible, so the excavation could not be enlarged. By building a special support for the overhead traveling crane, however, the vertical unit was installed, though there was less than 6 in. spare headroom. Ingenuity was also required for fitting together various pieces of apparatus which had not originally been intended for use in this plant.

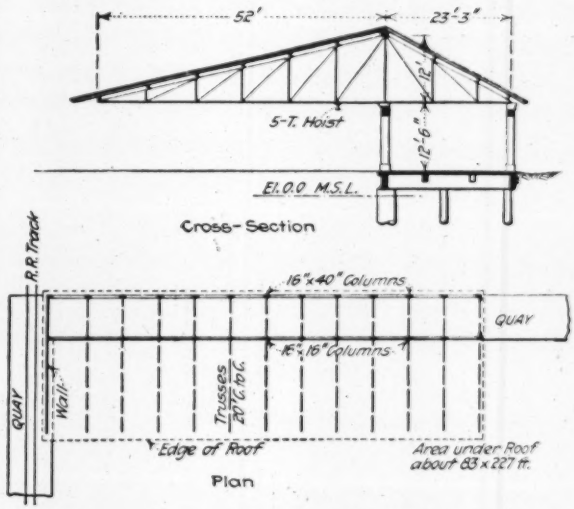
A feature of the installation is that in order to provide as much light as possible practically the entire front of the structure which houses in the adit entrance is made of glass. Because of the deep snowfall at this point an inclosed stairway of about 400 steps was built to provide access to the flat situated above the dam.

J. P. Jollyman, engineer of electrical construction for the Pacific Gas & Electric Co., handled the details of design under the general direction of P. M. Downing, chief engineer of the electrical department.

Steel Cantilever Roof to Shelter Panama Boat Landing

By R. C. Hardman
Engineer Designer, Panama Canal, Balboa Heights, Canal Zone

IN ORDER to construct a shelter, for small boats, with a large space unobstructed by piers and columns, an unusually long cantilever roof has been designed for use at the Atlantic end of the Panama Canal. The structure is situated upon a reinforced-concrete quay 25 ft. wide, and has a projection over the water of 52 ft.; as will be seen in the plan it occupies a space at the corner of a basin formed by the quays.



ROOF WITH LONG OVERHANG ANCHORED TO QUAY THROUGH COLUMN REINFORCEMENT

The roof is supported by an end wall of reinforced concrete, which takes the place of an end truss, and by two rows of reinforced-concrete columns located along the land and sea sides of the quay, respectively. The negative reactions on the land row of columns are taken care of by anchorage; the steel reinforcement of the columns extends into the caps of the piles and hooks around the cap reinforcement, consisting of 70-lb. rails. As no kneebracing was desired, the columns were designed to take the wind stresses by acting as cantilever beams. The trusses are held in place by the usual longitudinal and vertical bracing. The tops of the columns in each row are connected by reinforced-concrete longitudinal struts.

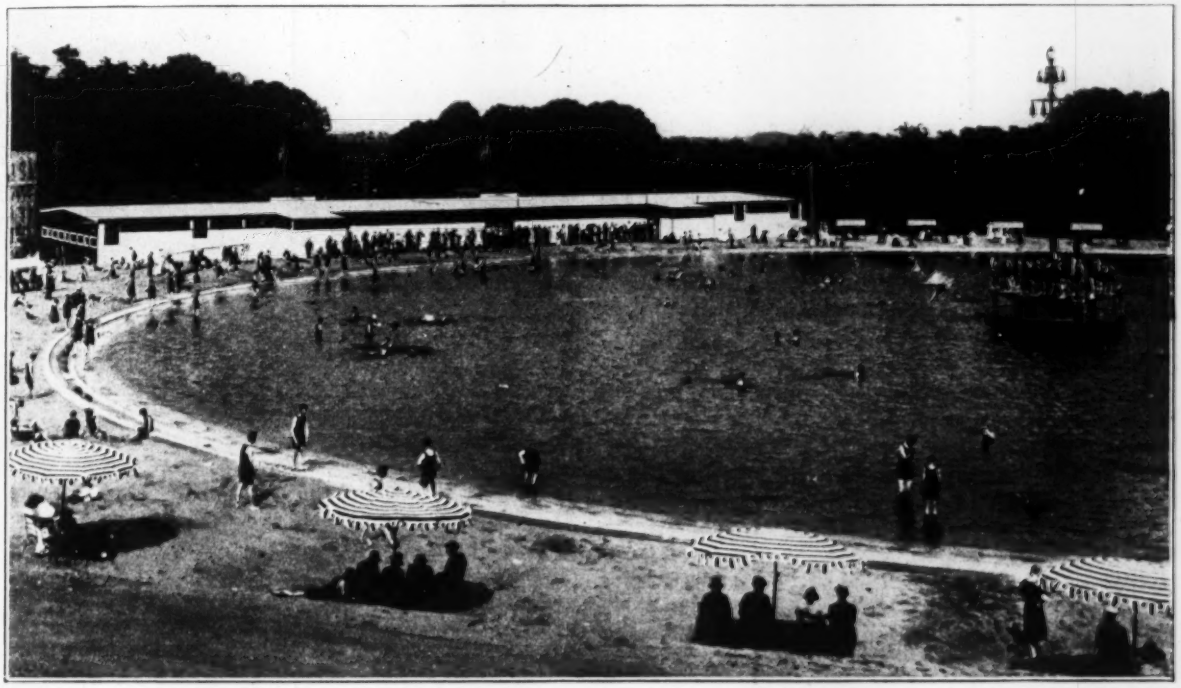
For handling small boats a 5-ton hoist traveling the length of the structure is provided. In addition to the mooring rings in connection with the fender system of the quay, the longitudinal struts on the overhanging portion of the roof have lines for the mooring of small craft.

Large Outdoor Swimming Pool Built in Circular Form

Bottom Increasing in Depth Toward Center Is Paved with Reinforced Concrete—Water Pumped from River and Filtered

By C. E. Bliss
Of Bliss & Lavalle, Architects and Engineers, Springfield, Mass.

MOST swimming pools, both outdoor and indoor, are built rectangular in shape, with one end shallow and the depth increasing toward the other end. There has recently been built near Springfield, Mass., a large outdoor pool which is novel in that it is circular in plan. The pool is in an amusement resort known as Riverside Park, in the town of Agawam, Mass., on the west bank of the Connecticut River, which is now polluted beyond bathing use by sewage and factory wastes. Water is pumped from the river and passed through mechanical filters.



BUILDING SWIMMING POOL IN CIRCLE AFFORDS ACCOMMODATION FOR MANY BATHERS

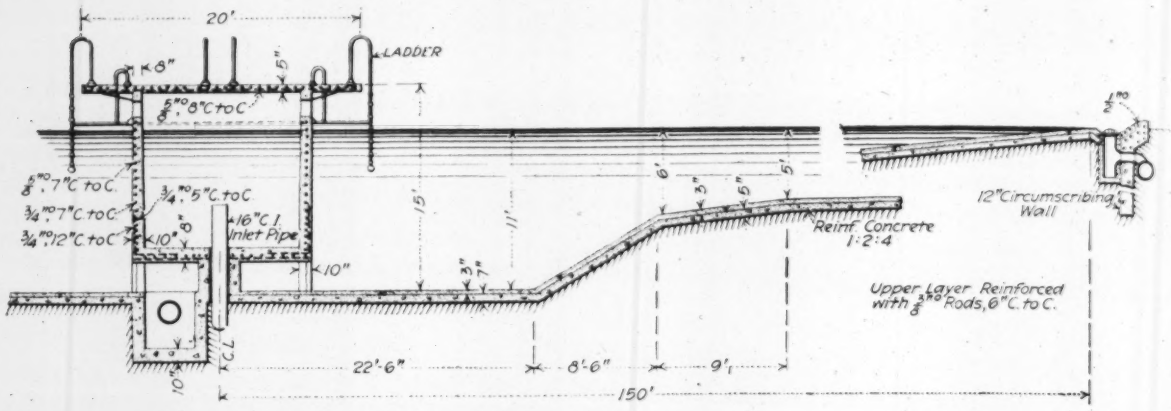
After a careful study of conditions it was determined to build a circular pool, the depth of water to increase gradually to a point near the center, where it should be 6 ft. deep. At this point the floor was dropped more abruptly so as to give a space around the center diving platform, where the water would be 11 ft. deep. With the usual rectangular pool those who cannot swim wade in the water at the shallow end, while the other is used for swimming and diving. As fully 75% of the people who visit a public swimming pool cannot swim, one end of such a pool is badly crowded, the other, or deeper end, being used by the comparatively small number of swimmers.

A circular pool has many advantages. It is impossible for one to fall into deep water from the shore. The maximum amount of space in which non-swimmers may bathe is attained, and if any of these should wade out beyond his depth it is easy for a guard, stationed on the diving platform at center, to reach and help him. The locating of the diving platform at the center gives the swimmers who wish to use it a better chance, as only those who can swim can reach the platform. Swimmers also can pass beyond the wading space and find a part of the pool which is not crowded. The circular pool also makes possible a much larger beach area—a very important adjunct to a swimming pool.

This pool, which is one of the largest in the United States, is 300 ft. in diameter, is built approximately 900 ft. back from the river, and at an elevation which makes the water level in the pool 50 ft. above that in the river. It has a capacity of 2,000,000 gallons.

An under base varying in thickness from 3 to 7 in. was first poured. This consisted of one part cement, two parts sand and four parts stone, which left a reasonably even surface. No reinforcing steel was used in the under base. The upper layer of concrete was put in 3 in. thick over the entire surface and was reinforced with $\frac{3}{8}$ in. round rods placed on 6 in. centers in both directions.

For waterproofing, hydrated lime was used through-



HALF CROSS-SECTION SHOWS CIRCULAR CONCRETE SWIMMING POOL AT AGAWAM, MASS.

out the entire upper layer, being incorporated with the concrete in the mixture. This has proved satisfactory, for although careful watch of the pool has been kept since it was put into commission no appreciable leakage has been found at any point. One-half inch of the upper layer was put in as a finish, this being added before the other 2½ in. had become set. The ½-in. finished surface was made up of one part of Medusa white cement and 1½ parts of sand, the surface being smoothly troweled. This white cement proved very satisfactory, for although no special white sand was used a very light surface has been obtained.

Expansion joints to the full depth of the 3 in. upper layer, dividing the surface into 25 ft. squares, were left when the concrete was poured. After they had set they were calked with oakum, poured nearly full of hot asphalt and finished with cement of the same mixture as the ½ in. top surface.

To supply water three De Laval horizontal single stage centrifugal pumps were installed, two of these, having a total capacity of 3000 gal. per minute, being located at the pump house and supplying water to the pool through a 16-in. cast-iron pipe-line. The water before entering the pool is passed through a battery of filters of the pressure type made by the New York Continental Jewell Filtration Co. The third pump was placed in a house built over a well located in the overflow line from the pool. This pump was used to recirculate water, which was again passed through the filters before reëntering the pool.

All water entering the pool is filtered and discharged into a chamber at the center. It overflows from this chamber into the pool, where it is evenly distributed toward the circumference, overflowing into an open concrete gutter extending around the edge of the pool. In this manner the shallow water at the outside of the pool, which on a warm sunny day tends to become heated, is constantly being replaced by cooler water from the center. This arrangement also gives an ideal surface skim, and any lint which may come from bathing suits is quickly washed into the gutter at the edge.

Catch basins are located along the gutter and overflow water draining into them is returned to the river at some distance below the intake. During the summer the river water is found at times to contain a color of 50. This after filtering is reduced to practically zero, the water entering the pool at all times being better than 98% pure. All water entering the pool is treated with chlorine after being filtered.

As the pool is used for both day and night bathing, a proper lighting outfit was necessary, and the one selected was furnished by the General Electric Co. This consisted of one pedestal and twelve pendant lights, mounted on a pole at the center, giving a lighting capacity of 52,000 candle power, making it possible easily to read a newspaper at any point on the edge of the pool.

A bath house 64 x 212 ft., fitted with lockers to accommodate 3000 bathers, was erected. This was built with a lobby extending across the center of the building dividing the men's section from that occupied by the women. Each section was fitted with toilet room and shower baths, and the whole was planned to be well lighted at night. In the basement a complete steam laundry and sterilizer washes and dries all bathing suits and towels. Last summer the bath house often was occupied to its capacity and during a hot spell the bathers would average 5000 a day for a week.

In leaving the pool for the past winter, of record severe cold, the water was drawn down until it measured 5 ft. in depth in the center part; not a single crack developed in the concrete floor or the walls of the pool.

The whole pool with fittings was designed by Bliss & Lavalle, of Springfield, and the construction was carried out by Simpson Bros. Corporation, of Boston, Mass.

Marin Water District Absorbs Properties

The Marin Municipal Water District, in which nearly a score of small municipalities on the north side of San Francisco Bay have already been included, has recently absorbed the distributing systems of Fairfax, Belvedere, Larkspur and Corte Madera, and the Baltimore Park system is to be taken over in the near future. This will give the consolidated district control of every water-serving property in southern Marin County. A $3,000,000 development, which was described in *Engineering News-Record* of No. 8, 1917, p. 884, is now under way, and work is being rushed on the construction of a concrete dam and conduit line.

Guatemala Earthquake Shifts Steel Viaduct on Its Piers

Tower Legs Move Several Inches on Their Bases in Different Directions—Other Details of Earthquake Damage

By W. T. Penney
Contractor, Guatemala City.

READERS of *Engineering News-Record* will probably be interested in a short description of the effect of the recent earthquake in Guatemala on Las Vacas viaduct, situated in the suburbs of Guatemala City. This structure appears to have been the only bridge in the earthquake zone whose superstructure was affected.

The Las Vacas viaduct, carrying a link of the Pan-American line, ranks among the high bridges of the world, being 390 ft. high. It is 700 ft. long and weighs 700 tons. The tower columns of the viaduct are built up of two I-beams latticed together, and are surmounted by a box girder 5 ft. deep dropped over the tops of the columns and riveted to them. The struts and bracing of the tower are latticed members, with the exception of the transverse sway braces. The columns rest on concrete pedestals footing on conglomerate foundation. The chief engineer who directed the construction of the viaduct was careful to have the piers well set into the hard material, and this proved a wise precaution; the earthquake caused both sides of the barranca to slide, moving all the loose material and opening large cracks in the conglomerate, but the piers showed no movement.

Track Forced Out of Alignment

The morning after the first severe shaking, Dec. 26, 1917, the bridge was carefully examined before a train was allowed to cross. The first thing that caught the eye was the alignment of the track. The rails were out of line throughout, as much as 3 in. in some places. Further examination showed that many of the bolts which hold the trusses to the box girders had fallen out, leaving blank holes, but in no instance were all the bolts out of any one connection, so that the trusses had not moved. The nature of the damage to the bolts indicated that the movement that broke them was neither longitudinal nor transverse, but a wave movement.

The shift of the track suggested distortion of the towers. We examined the post feet and the piers.

The first tower, a short one, was in its true position. The second tower had moved downstream 3 in., further movement being arrested by the anchor bolts. The bolts (3 in. in diameter) are built into the piers and have nuts and large plates at their lower end; but to facilitate the placing of the steelwork in the event of slight errors in setting the anchor bolts, the holes in the column base plates had been made 6 in. in diameter. When the towers were erected many of the bolts came close to the edge of the hole in the column, and thus it was possible for the towers to move transversely almost 3 in.—which is precisely what happened.

Although several rods were broken and many were made flat, the towers remained in original vertical position. Some of the bents had moved upstream and some downstream. These shifts were exactly the same as the shifts of the track above. The reader may judge how the earth's surface moved in order to shift one tower in one direction and another in the opposite direction. That very large forces were involved showed up clearly in the course of jacking the posts back to original position.

The writer had charge of the jacking. As there were not sufficient jacks to move an entire tower, it was necessary to move one bent at a time. Two 50-ton and two 30-ton Norton jacks were available. They were set in a lifting and pushing position at each post foot. The 50-ton jacks had each two men to the lever, but in some cases, though the men pulled with full strength, the bents refused to move until the jacks were assisted by a ram consisting of a 80-ft. length of steel rail swung from a tackle.

The bottom of the barranca had cracks one could put his leg in. Severe shocks occurred every few hours during the time the jacking went on, but none was severe enough to disturb the structure again. Landslides were continually occurring during the five days it took to finish the job, and we felt relieved when we got through.

Anchor Bolts Displaced

Experience in a previous earthquake showed that the movements may be even more complicated and destructive. Some years ago the writer examined a smaller viaduct after severe shocks and found that every anchor bolt had lifted 2 in. These bolts originally had been set in holes drilled in the pedestal masonry and then cemented in. Had they been held by plates and nuts at the bottom like those of the Las Vacas viaduct, I believe the piers would have been ruined. In that same earthquake it happened that there was a skid close by, with timbers 12 x 12 in. x 30 ft. on it, and the timbers rolled over several times.

In the recent earthquake the Las Vacas viaduct was the most important bridge in the earthquake zone. In two others, however, the masonry was damaged: the pier and abutments of one bridge and the abutments of a masonry arch bridge. In both cases—and the same thing is true of every building in the city—a horizontal crack developed about 2 ft. above the ground line.

The houses, although absolutely wrecked above, were intact below the crack just mentioned. The heaviest buildings suffered most, not the weakest. The massively built old Spanish churches with walls 12 ft. thick were reduced to awe-inspiring wrecks. In some places blocks of masonry weighing at least 30 tons were found a hundred feet from the buildings to which they belonged. The ruins had the appearance of having been blown up by explosives rather than shaken down by earthquake. In spite of the severity and suddenness of the shocks indicated by these appearances, in several places where massive buildings were wrecked in this thoroughgoing manner walls of houses not 200 ft. away were still standing.

While not an item of structural damage, it may be of interest to note that the earth movements were invariably accompanied by subterranean noises. So far as could be judged, in fact, these fear-inspiring noises preceded the shock or earth movement. The movements themselves, which appeared to be a lifting and shaking, continued for hours, and were so strong at times that to remain in an upright position was difficult.

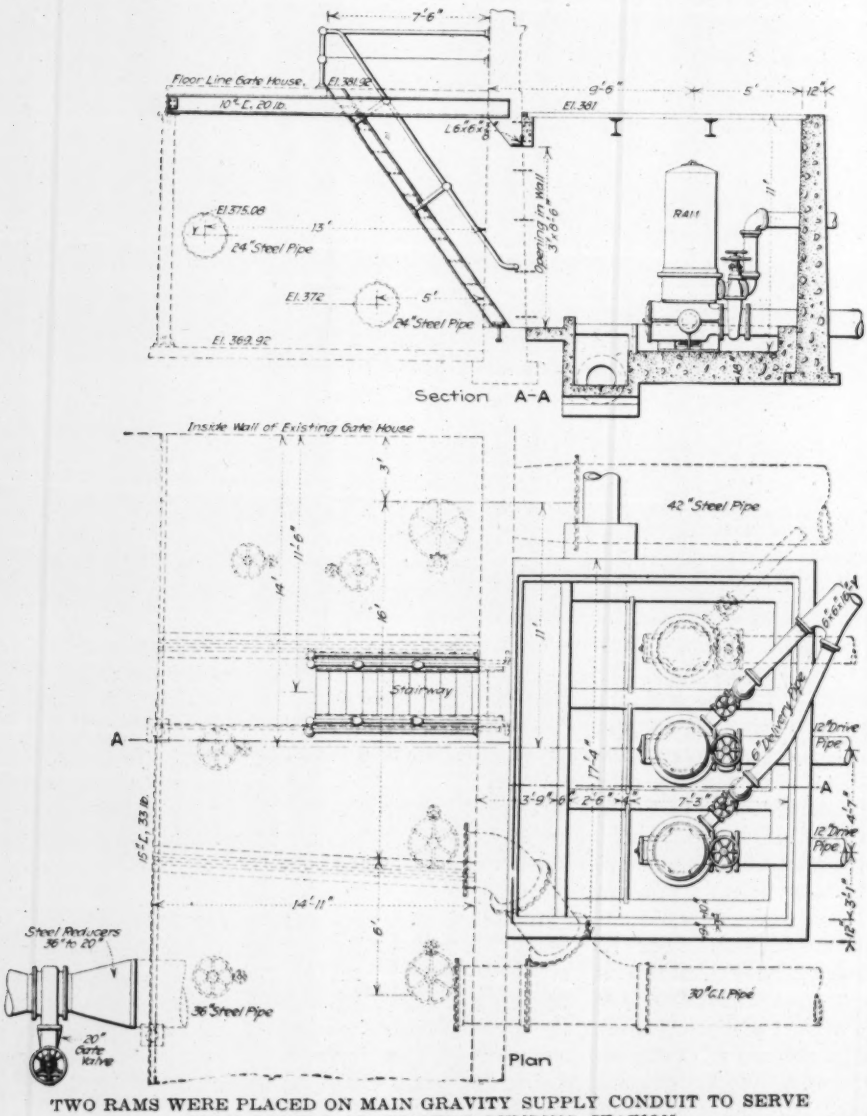
Hydraulic Rams Show 91 Per Cent. Efficiency

Working Under 48-Foot Power Head and 131-Foot Pumping Head, This Figure Was Attained at Seattle Water-Works—Almost No Operating Expense

By T. H. Carver
Assistant Engineer in Charge of Water-Supply, Seattle

THE Maple Leaf pumping station of the City of Seattle represents a new departure in the common practice for the construction of water-power pumping stations. This plant should be of interest to engineers, since it is believed that it develops perhaps the highest known combined power and pumping efficiency of any existing plant of like size or larger, and in addition shows unusual economy in installation and operating costs. It consists of two 12-in. Hill hydraulic rams operating under a 50-ft. power head and against a pumping lift of 140 ft. from a point above the rams to the full tank level. Performance tests showed a range of capacity of water pumped from 720,000 to 1,300,000 gal. per day with corresponding efficiencies of from 90.8% to about 85%. The normal daily operating capacity is something over 1,000,000 gal. of water pumped.

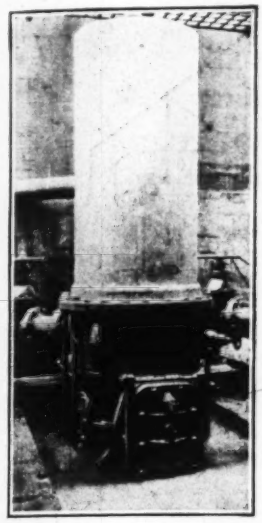
The main supply line from Cedar River to Seattle discharges at its far end into the Maple Leaf reservoir at El. 420 ft. A 30-in. overflow pipe, gate controlled, leads from this reservoir to the Green Lake reservoir, half a mile distant and 100 ft. lower. The Green Lake reservoir supplies the lower areas in the northern part of the city and the Maple Leaf reservoir the intermediate levels, leaving the higher levels to be supplied from a tank fed by a pumping station. Power for pumping is available from the water flowing from the upper to the lower reservoir. By using the rams with their high efficiency not all of the 100 ft. available head is required. In fact, 50 ft. only is used thus, allowing the plant to be located close to the Maple Leaf reservoir and the high-service tank and eliminating the long delivery line that would otherwise be required. The supply water for the rams is taken out of the 30-in. main by means of a 30 x 30 x 20 x 20-in. cross located just below the reservoir embankment. On one side the cross discharges into a short header from which individual 12-in. cast-iron supply lines 165 ft. long lead to the rams, while on the other side the cross is connected with a 16-in. standpipe running up over the reservoir embankment. The function of the standpipe is to take care of the oscillation due to the ram action and allow the 30-in main to feed steadily, thus reducing the water-hammer effect in this line.



TWO RAMS WERE PLACED ON MAIN GRAVITY SUPPLY CONDUIT TO SERVE HIGH LEVELS OF SEATTLE PUMPING STATION

The rams are set in a 12 x 14-ft. vault at the side of the existing gate house. Space is left in the vault for a third machine to be installed. Entrance is gained from the gate house. The rams discharge their power water downwardly and outwardly through their bases underneath the level of the tail water. This entirely elimi-

nates splashing and with the exception of the tail-water pits the vault is dry at all times. The tail water is carried away through a 16-in. waste pipe and returned to the 30-in. line some 300 ft. below the gate house. The rams discharge through short lengths of 6-in. pipe which connect outside the vault to a 16-in. main leading to the tank, 1500 ft. distant. Eventually the plant capacity will take care of some 28,000 population and furnish ample fire protection for the 790 acres involved. The rams are simple in operation. They are started with an auxiliary starting valve and adjustment for capacity is made by turning an adjusting screw up or down. All mechanical movement is limited to simple valve shifts of small motion, and as all moving parts are inside the machines, in water, no oil is used or required. The rams operate continuously in the locked gate house and inspection is made only once or twice a week by the regular water department employee. Maintenance and renewals, limited largely to new valve seats, are estimated to cost not to exceed $10 per year per ram. As wear is exceedingly light the rams maintain their full efficiency for long periods.



RAMS WERE PLACED IN EXISTING GATE HOUSE

TESTS OF 12-IN. HYDRAULIC RAM

Maple Leaf Pumping Station, Seattle, Wash.

Strokes per Minute	Power Head, Ft., H	Pumping Head, Ft., h	Water Wasted, C.F.S. Q	Water Pumped, C.F.S. q	Efficiency Per Cent. $\frac{q\,(h)}{(Q+q)\,H}$
65	48.7	130.7	1.08	0.555	90.8
50	48.0	131.6	1.53	0.755	90.5
45	48.0	133.8	1.78	0.846	89.6
41	47.9	131.2	1.91	0.915	88.8
40	47.9	133.8	2.04	0.930	87.5
37	47.9	127.8	2.04	1.020	89.0
32	47.8	135.9	2.66	1.080	82.3

The accompanying table shows results of tests made by the city engineering department. Each of the two rams showed practically identical results. One ram only was tested at a time, the measuring weir being too small to allow of full plant capacity. Water pumped was measured volumetrically in the tank. Waste water was measured over a standard sharp crested weir and D'Aubuisson's formula was used in figuring efficiency.

The machines were manufactured and supplied by the Hill Hydraulic Machinery Co., Seattle. The installation was made by Swensson & Co., contractors, Seattle, under the direction of the engineering department of the City of Seattle, A. H. Dimock, city engineer, T. H. Carver, assistant engineer in charge of water supply.

Laconia Street Department Uses Four Snow Rollers

Six Horses and Three Men Cover 15 Miles of Road in Nine Hours at Average Cost of $1.40 a Mile

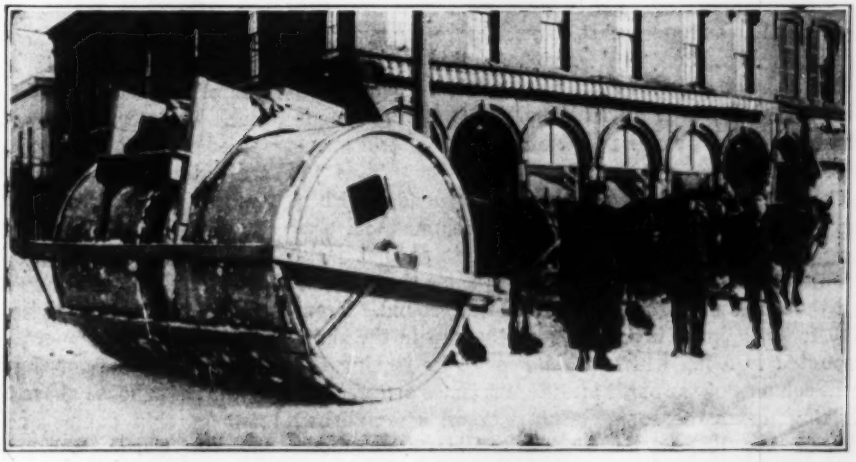
BY CHARLES A. FRENCH

City Engineer and Street Commissioner, Laconia, N. H.

SNOW rollers have been successfully used by the street department of Laconia, N. H., for several winters past. Four were in operation during the past winter. The roller shown in the view is 6½ ft. in diameter. Each half is 5 ft. long. It has an effective snow-compacting width of about 12 ft. At present prices such rollers would cost $150 to $200 each. The roller weighs 4750 lb. with nothing on it. When the snow is not too deep it can be operated with four horses and one man. Wages this winter were $2.75 per day for labor and $6 per day for two horses and driver for a 9-hour day. The rollers are used chiefly in breaking country roads. For that purpose they are sent out when there is a snowfall of 4 in. or when a lesser depth has drifted. One man drives the four or six horses attached to the roller and others are sent to shovel when drifting occurs. Sliding places and chuck holes are roughly leveled by the shovelers, and the roller passing over compacts the snow so that it will hold up a team, and the road requires no more attention until the next storm.

An average trip requires six horses, three to four men, and they cover 12 to 15 miles in nine hours, so that the cost is about $20.75 for 15 miles of road, or about $1.40 per mile. Of course the character of the snow-storm varies this cost.

In this climate if the roads are rolled after each



SNOW ROLLERS ARE USED ON BOTH CITY STREETS AND COUNTRY ROADS

snow or blow they build up through cuts where snow drifts so that the snow blows over the roadway and little hand labor is required. They make a hard path which is wide enough for sleighs to turn out when meeting without getting into the soft snow. Rollers also pack the snow on exposed places that would blow bare and spoil the sledding. In many places we have excellent roads on top of drifts 6 to 8 ft. deep.

In the spring, when the snow softens, some of the deeper drifts have to be cut out with a road machine mounted on runners, but it is surprising how much is saved in hand labor by the use of rollers.

On city streets, after the sidewalks are cleared, the snow is leveled and spread by means of road machines on runners and then rolled by snow rollers. In cold weather we are able to use four-ton motor trucks on these rolled snow roads, but not when the snow is deep during a thaw.

Steel Cantilevers Hold Headframe Over Mine Shaft

Unstable Ground Necessitates Special Construction—Cantilever Frame on Solid Ground Carries Hoisting Sheaves

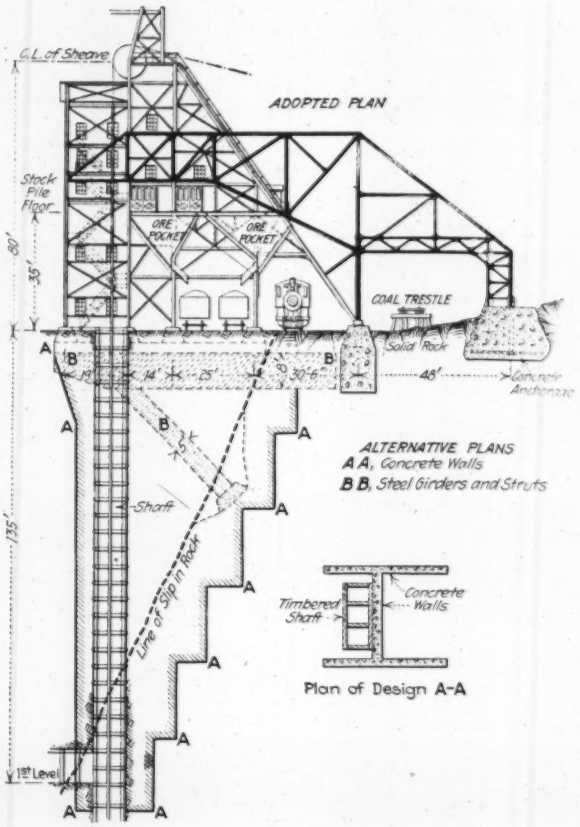
SUPPORTING the headframe over a mine shaft by cantilever trusses was the expedient resorted to at the "A" shaft of the Pioneer mine of the Oliver Iron Mining Co. at Ely, Minn., because of unstable ground.

This shaft was sunk in the early '90s, and was then equipped with a timber-frame shaft house. It had been impossible to explore the ground in advance to such an extent as to determine thoroughly the nature of the underlying rock, but no change of alignment was experienced until 1900, when a slip in the formation was noticed about 135 ft. below the collar of the shaft. The depth at that time was 1100 ft. The alignment was maintained without difficulty, however, by trimming the timbers and occasionally replacing a shaft set.

A steel headframe was built in 1909, up to which time the settlement at the surface had not been very serious. In this structure the rear columns were placed 70 ft. from the shaft and were supported on independent concrete piers founded in good solid ground. The front columns and ore-pocket columns were supported on a concrete base, 50 x 65 ft. and 3 ft. thick, reinforced at top and bottom with steel rods, so that when settlement occurred the entire front portion would move uniformly, thus causing no undue stress in the steel members.

The bases of the rear columns were provided with a hinged joint. The bases of the front columns and ore-pocket columns were fitted with brackets so that jack-screws could be placed under these to raise the columns and thus take up any settlement of the ground. From 1909 to 1912 the settlement due to the slip in the shaft amounted to 9 in., which was taken up by jacking the front columns of the shaft at different times and putting blocking under the bases. This was all accomplished without any distortion of the shaft-house members.

Movement of the ground became much more serious in 1912, and it was apparently unsafe to continue mining



HEADFRAME OF MINE SHAFT IN LOOSE ROCK IS CARRIED BY CANTILEVER FRAMES

operations near the shaft without making provision to support the shaft house. Consideration was given to three different methods for supporting the shaft house and pockets.

The first plan was to excavate the entire portion between the line of slip and the shaft and construct a vertical concrete wall with two wings, all founded on solid rock. This would extend from the first level in the shaft, 135 ft. below the collar, to the underside of the reinforced-concrete base supporting the front portion of shaft house, as shown by dotted lines A—A in the drawing. The wall would carry the entire load of the foundations, tracks, cars, front portion of shaft house and ore in shipping pockets, and would support the rear portion of the mine shaft from the first level to the surface. The second plan was to excavate beneath the reinforced-concrete base and place two horizontal steel girders under it, as shown by dotted lines B—B. The rear ends of the girders would be anchored on good ground back of the slip, while the ends over the shaft would be supported by structural steel struts or columns placed at an angle of 45° and seated on solid rock.

The third plan, which was adopted, was to construct a steel cantilever support, having its footings on permanent ground back of the slip. This carries the portion of the shaft house above the stockpile trestle, which consists of skip dumps and headsheaves. All main columns of the shaft house were disconnected at splices at the stockpile floor elevation, except the rear batter-brace columns, which have a firm footing. The canti-

lever support thus maintains the headsheaves and skip dumps in permanent position, while the front portion of the shaft house, including the stockpile floor and shipping pockets, now cut loose from the upper portion, will be kept in position by jacking up and blocking the column bases as may be required by ground settlement.

Adoption of this plan was based upon the fact that its first cost was the lowest, and that this structure was above ground where it could be erected readily and inspected easily. Since the rear columns of the cantilever support are on solid rock and have an uplift, the pier excavation was made in the shape of a prismoid and the concrete was poured without the use of forms. The concrete pier was made large enough that its weight balanced the uplift due to the weight of the shaft house portion; the bond of the prismoid in the solid rock is an additional safety factor.

Since the mine shaft is constructed of timber sets and is considerably larger than the skips and cages, there is sufficient room for lining the timber guides without retimbering or enlarging the shaft. The cantilever support has now been in service for practically five years, and has kept the upper portion of the shaft house in accurate alignment. The lower portion has settled 2 ft., which has been taken care of by jacking up and blocking the front columns.

Gravity Track System at Anthracite Coal Breakers

Advantages and Disadvantages of Five Typical Layouts Applicable to an Up-to-Date Colliery, Which May Load 70 Cars Daily

By F. N. Rupprecht

Engineering Department, The Delaware and Hudson Company, Wilkes-Barre, Penn.

While the sources of our most important fuel are within comparatively small and restricted areas, manufacturing industries which depend on coal are widely scattered. Consequently the distribution of coal is a matter of no small importance. It may be estimated that in the United States nearly half a million freight cars are continually in the service of the coal traffic. All railroads derive some revenue from the coal traffic, but with some roads it is the main source of revenue. These latter roads, as a rule, orginate the coal traffic, and are vitally interested in methods which prove most economical in handling this traffic. This applies particularly to the loading of cars at the mines and the subsequent making up of trains.

This paper will deal in particular with the conditions and the methods employed in the anthracite coal region of northeastern Pennsylvania. Coal-mining and transportation facilities have a mutual attraction for each other. If convenient, collieries are located close to the main line of a railroad, otherwise a branch is built to a convenient colliery location. The former is preferable, because in a thickly settled, rolling country, the construction of branch lines is difficult, and because of the high real-estate values, very costly. Oftentimes the haulage problem can be more readily solved by narrow-gage tracks, over which the unprepared coal can be taken to a convenient colliery location, either on the surface or underground. Nevertheless, an extended net of railroads traverses the coal region and traffic moves in all directions.

The annual production of more than 80,000,000 tons of Pennsylvania anthracite coal is divided among many collieries. Their daily capacity ranges from 500 to 3000 tons and more, but the maximum capacity is not maintained all through the year. For an eight-hour working day the annual production of an up-to-date colliery will not be much more than 500,000 tons. At the rate of 3000 tons per day, about 70 cars will be required to move that amount of coal from the colliery. As 45 tons per car may be taken as a fair average of car capacity, it can be readily seen that the cost of switching such a number of cars day after day for the purpose of loading them would be extremely high.

Elements of Track Systems

Collieries are constructed with the intention of giving service for many years; they may be in operation for 50 years and more. Consequently a careful study of the requirements of each individual colliery in regard to track facilities is quite appropriate. Generally each colliery has on one side some tracks for holding empty cars, the "light tracks," and on the other side some tracks for holding loaded cars, the "loaded tracks." There are also on each side of the breaker, between it and the light and loaded tracks, two scales, the "light" and "loaded" scales respectively.

The track connections and the grade are so arranged that a locomotive places only empty cars above the breaker, and takes out loaded cars below the breaker, while the cars are run by gravity through the breaker for the purpose of loading the coal. The movement of the cars between the light and loaded tracks is not continuous, however; they are stopped at the light scales for weighing, then spotted under a chute in the breaker or beside it, and stopped again for weighing at the loaded scales. The operation of placing empty cars and taking away loaded cars does not interfere with the operation of loading and weighing the cars. The tracks running through the breaker and over the scales are not intended for locomotives as far as curves and track materials are concerned. In the same way the scales are constructed only to weigh cars, and have no dead rail to permit a locomotive to run over them.

As to the grade of the breaker tracks—experience has shown that a 1.5% grade is about the most desirable for the operation of a gravity system. Under favorable conditions cars will run on a 1.25% and even on a lower grade, but around sharp curves on comparatively rough tracks and for operation in winter time, anything less than a 1.5% grade proves insuffi-

cient. On the other hand, grades very much over 1.5% will make it comparatively difficult to stop cars readily on the scales and under the breaker.

The accompanying sketches are typical illustrations of track systems at coal breakers. Generally they may be grouped into four distinct classes. Their main difference is the method in which they are connected with the main tracks.

From an operating standpoint the most desirable method is to have connections with the main tracks for both the light and the loaded tracks, as shown in Fig. 1. In this case, however, it is as a rule a difficult matter to get the necessary 1.5% grade adjacent to the main line without resorting to a hump in the light-track connection, a depression in the loaded-track connection, or possibly both. Besides, if the main line has a low grade, the approach to the hump will be of considerable length, and therefore require more track, and finally the distance between the light and loaded track connections on the main line will be increased. It will be only in rare cases where the ground adjacent to the main line will be favorable to the location of such a system without excessive grading, and where the required right-of-way will be available for such a purpose. At any rate, track systems with connections on both ends will always be the most expensive to install, and it is doubtful whether the advantages from an operating standpoint are of much significance.

The method most frequently employed is to provide a direct connection from the main line to the loaded tracks, as shown in Fig. 2. A thoroughfare or running track is constructed alongside the loaded tracks to a point above the light scales, where it connects with all the light tracks. The only disadvantage of this construction is the interference with the continuous loading of cars when the locomotive places the empties into the light tracks. However, this operation takes only a comparatively short time, and if convenient can be carried out during those hours when the breaker is idle.

The advantages in the construction of this type of track system will be readily appreciated. The construction of the type previously considered is quite rigid and does not permit much variation either in the alignment or the grade, but this type is quite flexible and can be fitted to local conditions satisfactorily in most cases. As the grade of the tracks can be raised or lowered to fit the ground, the grading will be reduced to a minimum. At the same time it is not necessary to have the breaker tracks parallel or nearly parallel with the main line; they can curve in any direction and remain on land which is available and best suited for the purpose. The high ends of the light tracks are not connected with each other; it would be useless to do that; moreover, the stub ends save car capacity and reduce the length which otherwise would be required for the light tracks and the track system in general.

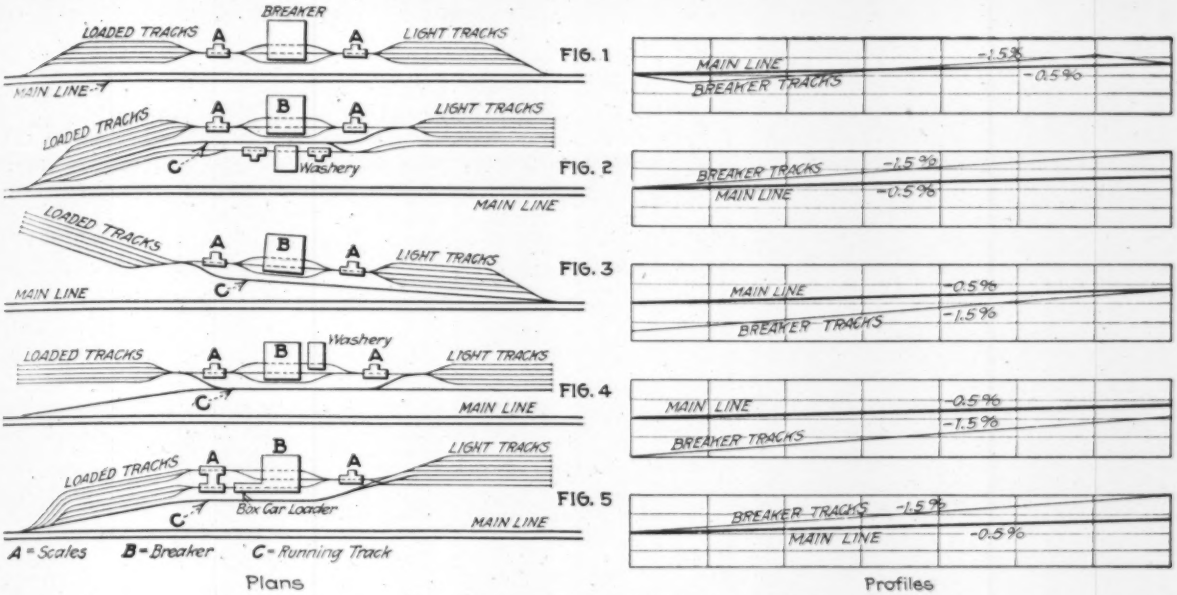
Fig. 3 shows a track system in which the light tracks are connected with the main line. This construction is not quite so desirable as the one just described. The main objection is in the fact that the locomotive does more or less switching when the loaded cars are taken away, and this switching necessarily interferes with the running of the loaded cars out on the loaded tracks immediately after they have been loaded. Whenever convenient, the loaded cars can be taken away during the hours when the breaker is not in operation, but generally there will be more interference in taking the loaded cars away than there will be in placing the empties on the light tracks. There is also to be considered that in this type loaded cars have to be hauled up a steep grade when they are taken away from the colliery. However, such a track system is resorted to in places where the main line is on a high embankment and where it is desired to construct the breaker on the low ground alongside of it. In flexibility of construction there is no difference whether the light tracks or the loaded tracks are connected with the main line—the difference is in the operation alone, as has been shown.

A track system not frequently employed is shown in Fig. 4. The far ends of both the light and the loaded tracks are disconnected and both operations of placing empty and taking away loaded cars will result in interference with the continuous loading of cars, because the only access to the tracks is over the connections from the breaker side. Moreover, a reverse movement will be necessary, either in placing empty or taking away loaded cars, depending on whether the loaded or the light tracks form a continuation of the branch leading to the colliery. Therefore, from an operating standpoint such a track system is not very desirable. Its advantage is in the fact that for the same car capacity it will require less space than any other system, and that it can be very readily adapted to the various conditions of insufficient right-of-way and unfavorable topography. A construction of this type will be found usually some distance from the main line of a railroad. The difference in elevation between the main line and the colliery tracks will determine to a considerable extent the location and grade of the branch line.

Washery Tracks

With the ever-increasing cost of coal there has gone hand in hand an increasing demand for the small sizes which were formerly wasted in large culm banks, together with waste rock. Now many washeries, which are usually located adjacent to the collieries, are reclaiming coal of small size from the waste banks. There are a considerable number of culm banks, however, in locations where the collieries have been abandoned. In such cases the tracks serving a washery are very simple, as the capacity of an ordinary washery is only a few hundred tons per day. Frequently only one single track, without scales, is run either through the washery or beside it, and the grade of the track is such that the cars can be run by gravity after they have been placed by a locomotive.

When a washery is constructed close to a breaker, it is very desirable to have it by the side of the breaker, provided there is sufficient room, because then there will be no duplication of facilities, and the washery will be benefited by all the advantages connected with the breaker track system. However, on account of lack of sufficient space, it will not always be possible to effect such a location, and quite frequently the washery is located on the other side of the running track, opposite the breaker, as shown in Fig. 2. The tracks serving a



FIVE TYPICAL RAILWAY TRACK SYSTEMS AT ANTHRACITE-COAL BREAKERS

washery will be constructed on the same principles as those serving a breaker, and parallel with them, though of course their capacity will be so much less.

At times existing collieries may be overhauled; they may be equipped with improved machinery and their capacity may be increased. Then it may be necessary to provide additional tracks to take care of the increased output. A track system which has been constructed from the very beginning with the intention of occupying as little space as possible may present a difficult problem when extensions are required, without the spending of too much money. If it is impossible to add to the existing tracks in length, which is no uncommon occurrence, the only choice is to construct new tracks alongside the existing tracks and make the best connections possible. Fig. 5 shows a satisfactory method of adding to the capacity of a track system which could not be extended in length. Each group of light tracks has to be accessible to the running track (for placing empty cars) as well as to light scales. This results in a set of crossing frogs. The loaded-track additions require the construction of a second loaded scale, so as to use all the available space.

The total capacity for which the light and the loaded tracks should be designed will depend not only on the capacity of the colliery but also to a considerable extent on the operating conditions. After the daily capacity of a colliery goes beyond a certain number of cars which can be handled by one locomotive, the capacity of the tracks may have to be only slightly in excess of that number of cars, because then the switching service can be so timed that there will always be empty cars on hand. For instance, a train of "empties" may be placed early in the morning and another train early in the afternoon.

The rail used in the construction of breaker tracks is usually relayer, and in places where the track is not touched by a locomotive it may be as light as 62 lb. per yard. Turnouts through which locomotives run are usually No. 8s, but those which only take cars may be No. 6s or even No. 5s. To save room three-throw switches are frequently used.

Formerly scales 38 ft. long were ample, but now the length of cars has been increased so that even 42-ft. scales are getting too short and 50-ft. scales are being installed.

The loading of box cars is an everyday practice. To facilitate the filling of cars to their full capacity on the ends, box-car loaders are being constructed at the largest and most up-to-date collieries. They consist of a type of vertical turntable on which the cars are set and revolved in a vertical arc. First one end of the car is lowered and filled with coal, then the other.

Modern collieries also have facilities for the economical handling of condemned coal. Cars of condemned coal are taken by a locomotive from the loaded tracks, and placed on the light tracks. Thence they are run by gravity over a hopper pit, just above the breaker, emptied and again spotted for loading, while the condemned coal is being taken by a conveyor back into the breaker.

One of the outside light tracks is frequently used for the unloading of supplies of various kinds, such as mine props. Sometimes there is also an extra track leading to the power house where fuel can be unloaded

Bridges at Des Moines Have Snow Chutes

Rapid removal of snow from bridges by dumping it into the river is provided for in two concrete arch bridges now being built over the Des Moines River at Des Moines, Iowa. At the center of each span, in the middle of the roadway, there is a 24-in. hole or snow chute. This is lined with vitrified sewer pipe and fitted with a cast-iron manhole cover. Snow can be collected at these points by wagons or graders and shoveled readily through the openings. If graders are used there need be no shoveling into wagons. This plan was devised by Karl C. Kastberg, city engineer.

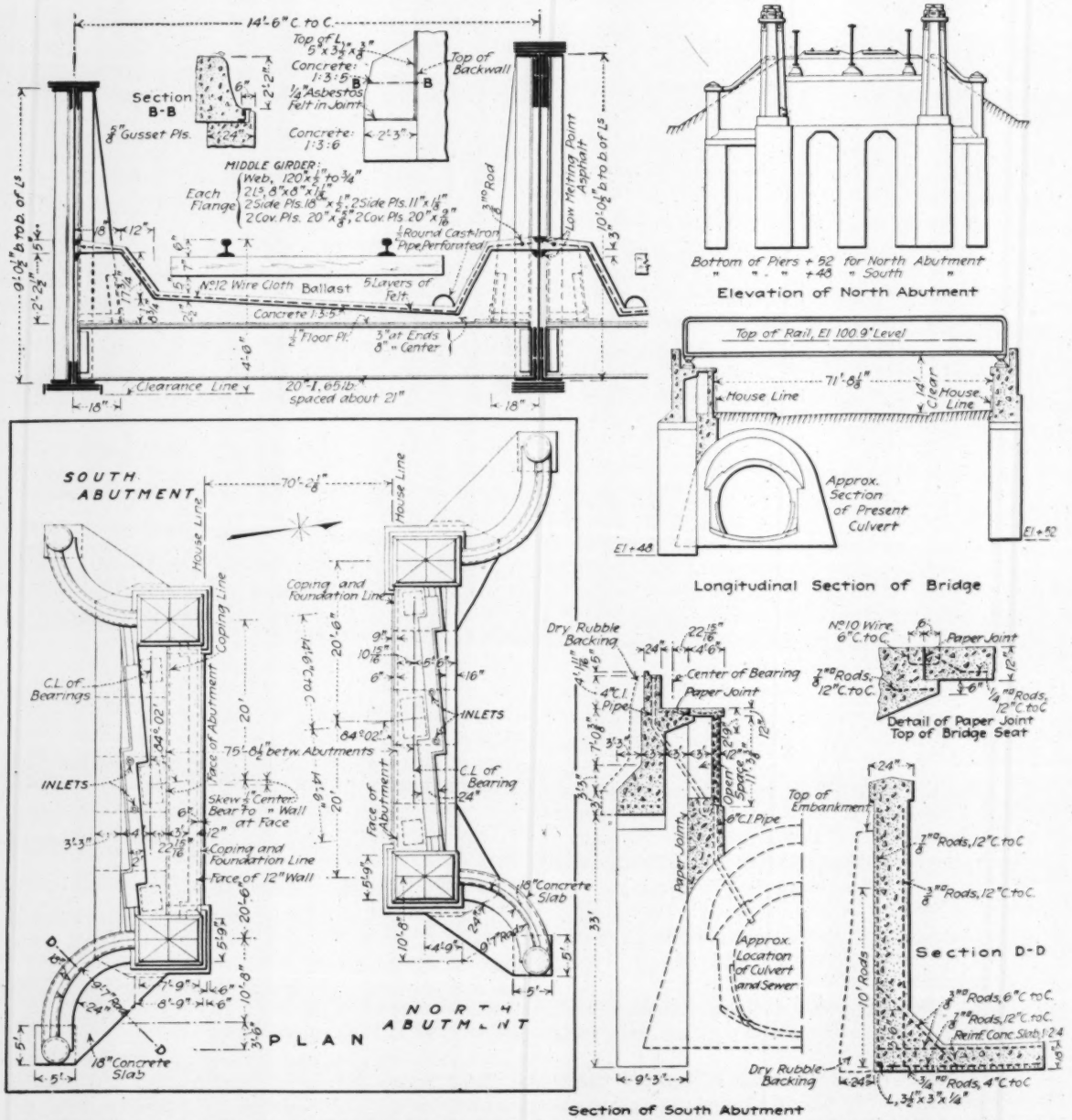
Bridge Abutment Has Pier Footings and Curved Wings

Old Creek Bed Necessitates Special Abutment and Wing Design for Railway Bridge Over Philadelphia Street

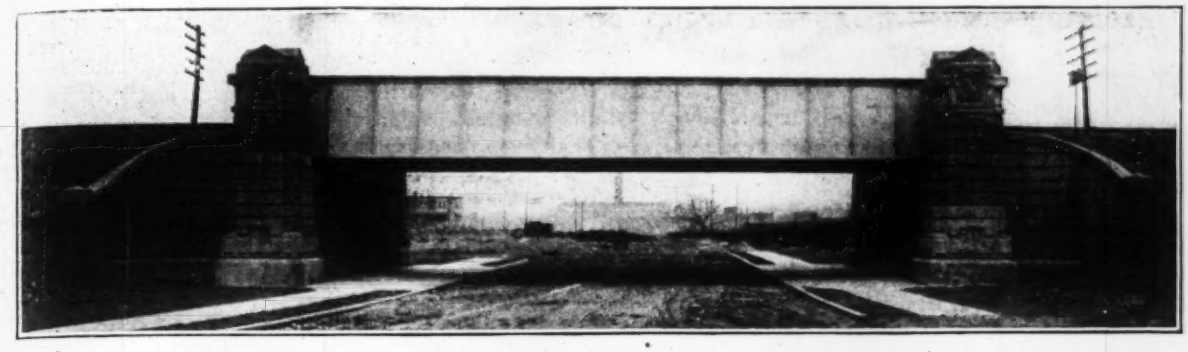
BY JONATHAN JONES
Assistant Engineer (Bridges), City Hall, Philadelphia, Penn.

THE photograph herewith reproduced shows in virtually completed condition an undergrade bridge in Philadelphia, which possesses some foundation and structural peculiarities to which these notes will direct attention. This bridge carries the two tracks of the North Pennsylvania R.R. (Philadelphia & Reading Railway Co.) over Annsbury St., a newly-opened 70-ft. residential street. The crossing is only slightly skewed.

The location of Annsbury St., derived from the block lengths of the neighborhood, places it over the irregular course of the former Wingohocking Creek, which at the bridge site lies closer to the south house line than to the center of the street. The railroad company many years ago carried its embankment over this creek on a masonry arch culvert of about 24 ft. span. In 1909 the city absorbed the stream in a sewer, which at this point is of a special section, 17½ ft. in width and height, built inside the old culvert, with earth packing between the sewer roof and the culvert soffit. The southerly haunch of this composite sewer lies under the south house line of Annsbury St. at such a skew thereto that there is practically no interference at the southeast corner of the bridge abutment except of about 8 ft. at the southwest corner.



ANNSBURY STREET BRIDGE—SOUTH ABUTMENT SET BACK TO AVOID SEWER, AND CURTAIN WALL PLACED ON STREET LINE; CURVED WING-WALL BETWEEN PIERS RESTS ON L-SHAPED FOOTING



RIGHT-HAND ABUTMENT IS SET BACK FOUR FEET AND IS MASKED BY FACE WALL

The old stream was practically on bedrock, about 50 ft. below top of rail, with little material above it except fill, incapable of supporting a heavy bridge. The natural abutment design, and that adopted for the north abutment, is solid concrete construction from the bridge seat to a few feet under the street surface, then concrete piers to bedrock. One such pier is located under each girder and one under the outer extremity of each wing, making five piers in all; the abutment and wings span the gaps from pier to pier.

On the south side of the street it would have been unsafe to found such piers on the arch culvert and transmit the superstructure loading thereto. The bridge span was therefore lengthened 4 ft. at this end, so that the piers could be carried down to rock, by channeling the inclined back of the culvert abutment, without endangering the sewer structure.

To have left a 4-ft. offset from the house line to the showing face of the abutment would have been inadvisable, as the street will soon build up on the established building line, and the bridge location would be disfiguring and would appear to be the result of an inexplicable error. A reinforced face wall was therefore constructed on the house line to give the two abutments similarity of appearance. This face wall, being built on the culvert haunch, was made as light as practicable (12 in. thick) and separated from the abutment by paper joints so that the compression of the latter under load cannot be transmitted to the culvert. The detail shown for the bridge-seat joint secures the two walls by means of wire ties incapable of carrying appreciable shear.

Behind this face wall the abutment is thinned by the removal of superfluous thickness between girder bearings. The hollow space is drained to traps, thence into the sewer.

The resulting effect is that of entire symmetry about the center of Annsbury St., except for a deeper bridge seat on the south side; and this discrepancy is too high above the ordinary vision to be noticeable or important.

The depth of foundations, with small-pier construction as noted above, made an unusual wing design necessary, in order that the wings might be curved in plan as was architecturally desirable. A straight line adjoining the two piers at the extremity of each wing falls well outside the wing, which would accordingly be unstable if of the usual gravity section. As built the wings are apparently reversed from the familiar reinforced-slab type, the platform slab being in front of instead of behind the vertical slab. Earth pressure behind the wall tends to concentrate the vertical reaction necessary for stability near the outer edge of the platform slab, which is reinforced at the bottom with rods spanning from pier to pier. The slab thickness and reinforcement were computed as if the outer 2 ft. of slab supplied all the resistance required to prevent overturning; then the same reinforcement was used throughout the slab for simplicity.

The design of the visible masonry shows the grouping of elements usual to Philadelphia design, the abutments and wings being tied together and to the girders by pylons rising to the girder tops. Mosaic date tablets of colored Enfield tile, slabbed with a 2-in. concrete backing and placed as units in the pylon forms, add a touch of bright color. The steelwork is painted with white lead, tinted to harmonize with the scrubbed concrete.

The superstructure girders span the full street width (plus the extra 4 ft. at the south end). Intermediate columns, while cheaper in first cost, are regarded in Philadelphia as a serious detriment to the proper use and appearance of a street.

The beam-and-plate floor, concrete deck, and felt-and-asphalt waterproofing are substantially as standardized by the Philadelphia & Reading Railway Co., Samuel T. Wagner, chief engineer. Particular attention is paid to draining the deck into the sewer instead of over the backwalls, and to sealing the backwall against a backflow when the ballast chokes with ice. One of the common disfigurements of bridges of this general type is the staining of the abutment faces by water which leaks in from the backwall joint, gathering iron in solution as it comes, then flows over the bridge seat and down the face, producing yellow stains. A pocket of elastic asphalt is provided on the bridge under discussion, to seal this joint without interfering with expansion.

Construction was expedited by transferring railroad traffic to a detour embankment built clear of the bridge site and afterward removed. The cost complete without paving of the roadway was $41,600. The contractor was Donato Delise. The bridge was designed and built by the bureau of surveys, Department of Public Works, the writer being in direct charge, under Chester E. Albright, chief engineer, and George E. Datesman, director of public works.

Yielding Gates Designed To Stop Autos at Open Draws

Two Flexible Barriers Will Absorb Impact Shock by Brake and Spring Resistance if Struck by Vehicles

PROTECTION of highway approaches to drawbridges by means of barriers or gates which oppose yielding instead of rigid resistance to a colliding vehicle is the object of two devices now in use. The idea in each case is that the barrier will yield sufficiently to absorb the shock of impact but will effectually prevent the vehicle from breaking through. Both devices have been in service for some months.

In the Strauss device (see cut) each gate or barrier consists of horizontal cables carried in end frames or spacers which slide in the slotted faces of hollow columns connected by a lattice strut across the road. In the first installation, however, chains were used instead of cables. This installation was made in 1917 at the Matawan Creek drawbridge at Keyport, N. J. Each spacer is attached at top and bottom to a cable passing over sheaves A and B in the head and foot of the column. These cables provide for raising and lowering the barrier, the upper sheaves being operated by a 2-hp. motor mounted on the cross-strut.

The three horizontal cables which form the barrier are attached at each end to a second vertical cable. This passes over a sheave C in the head of the column, then down to a sheave on a counterweight and up to an anchorage at the top. The counterweights are to keep the barrier cables taut and to assist in operation. If an automobile should strike the barrier, this will yield by bowing forward, putting into action a brake which applies a continually increasing resistance to the automobile.

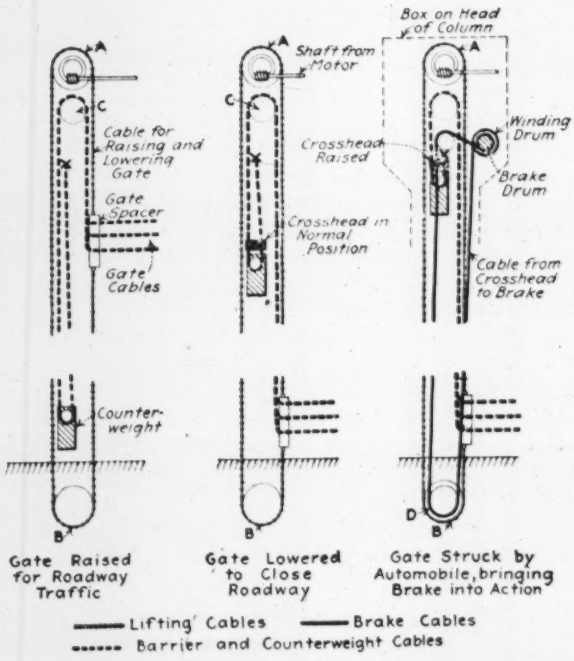


DIAGRAM OF MECHANISM OF STRAUSS BARRIER

Brake and counterweight mechanisms are entirely independent. With the ordinary raising and lowering of the gate the counterweight has a certain vertical travel and the brake does not come into action. When the gate is struck, however, the cables in yielding horizontally pull the counterweight above its normal position, so that it strikes and raises a sliding crosshead. This crosshead is attached to a cable which passes around sheave D at the foot of the post and then up to a winding drum having a brake drum on the same shaft. A cable also leads from the top of the crosshead to the drum. Current is cut off from the motor and a solenoid brake applied. The crosshead in rising pulls its cable off the drum against the increasing resistance of the brake.

When pressure is released by the automobile backing away, the counterweight drops to its normal raised position, returning the barrier cables to their taut position across the road. The crosshead remains in its upper position because the brake is still set. When the motor is reversed to raise the barrier it releases the brake, and the crosshead then falls to normal position by its own weight, overhauling the cable on the winding drum. In tests made with automobiles at a speed of 30 miles per hour the barrier is said to have had a horizontal movement of about 15 ft. before stopping the car. The maximum movement permitted is 20 ft. When the bridge is lowered the gate is raised and occupies a position within the cross-strut between the columns. The mechanism is so interlocked that the gates must be lowered before the bridge can be opened, and cannot be raised until the bridge is closed.

This cable barrier is the invention of J. B. Strauss, and is handled by the Strauss Yielding Barrier Co., Chicago. It has been ordered for the new Cherry St. bridge at Toronto, Canada, and also for the 12th St. lever-lift drawbridge at Chicago. In the latter case each barrier will be in two parts, with three columns. This will allow closing one side of the roadway to keep traffic from passing onto the bridge, while the other remains raised to allow vehicles in the opposite direction to pass off the bridge.

A different type of barrier, in which steel swinging gates are connected by a coupling which will allow yielding under impact but will still hold the gates together, constitute the protection installed in 1917 at the Belleville drawbridge over the Passaic River near Newark, N. J. The gate has two steel leaves swinging horizontally and meeting at the middle of the roadway.

On the end of each leaf is a horizontal stirrup or U-bolt whose legs pass through spiral springs fitted between the end plate of the gate and bearing plates on the stirrup. The springs are 15 in. long and 6 in. in diameter, made of ⅞-in. steel. They are inclosed in cylindrical casings. The faces of the two stirrups carry interlocking jaws through which is passed a vertical lock bolt. When the closed gates are struck they can swing to an extent limited by the springs, which are compressed as the stirrups pull outward. This lock is the invention of Jacob Harsen, 16 W. 184th St., New York.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

Society Purposes to Oppose Force With Engineering Intelligence

Preparation by American engineers for leadership in the coming industrial development of Russia is being urged by the Russian Society of Engineers of Chicago. This organization was formed for the purpose of helping introduce into Russia achievements of modern American engineering and to develop friendly relations between the two countries. These aims are of special importance now, since Russia is beginning to emerge from its chaotic conditions and to offer increased resistance to the German invaders. To strengthen this resistance means to keep the vast natural resources of Russia from falling into the hands of Germany. This as well as the great prospective market into which Russia will ultimately develop should interest the American business man, and especially the engineer, who is the modern industrial pioneer. To promote this work a series of lectures by Russian and American engineers on the industrial needs of Russia, and the mutual benefits to be derived from commercial intercourse, is being arranged by the society for Chicago engineers.

The Western Society of Engineers is in accord with this spirit of coöperation in this international, patriotic endeavor, and the first meeting was held May 22 in its rooms. The young men's committee of the latter society has already begun to study international subjects, having devoted time to Colombia and Russia.

It is certain that the American engineer's horizon hereafter will not be the boundaries of the United States and studies of foreign development problems must be undertaken if the engineer is to keep in the foreground.

Engineering Society's Committees Confer

To make the working members of the Western Society of Engineers conversant with the accomplishments and plans of the various committees, and the work of the society as a whole, 76 members, representing 22 committees, met with the 15 members of the board of directors. An affiliation plan, whereby the 14 local sections of national societies and the 11 technical organizations, in Chicago may coöperate with the military committee, is well under way toward accomplishing affiliation for other purposes. The advantages of diminished overhead, duplication of effort, and increased attendance at meetings, were emphasized at the meeting and the joint meeting idea received an impetus from an analysis of statistics of attendance. They are as follows: Annual dinner, 225; one joint meeting with sections of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, 220; two ladies' nights, 110; five joint meetings with section of electricals, 140; two bridge and structural meetings, 95; two general meetings, 79; two mechanical section meetings, 72; two hydraulic, sanitary and municipal section meetings, 45.

Numerous delays in the War Department which concern engineering activities were cited, and the military committee was asked to determine how the society could be of assistance.

Student Branch Problem Analyzed

Lack of coördination in the engineering professio is fostered by the national societies, perhaps unwit tingly, through their establishment of separate studen branches. As organized now, the undergraduate sections tend to disintegrate the profession rather than unite it. This is the opinion of Prof. John R. Allen, dean of the College of Engineering and Architecture, University of Minnesota. His argument follows:

"It is my opinion that the student branches of the various engineering organizations are doing a great work among our students and are a great stimulus to them in their college work. However, these branches could be more effective if they were all combined in one organization. This has been done in some of the engineering colleges and will undoubtedly be a desirable thing in all of them.

"In most colleges the freshman class is not differentiated into the various branches of engineering, and they are not differentiated until the beginning of the sophomore year. Under the present organization of these student branches there is no opportunity for the freshmen to join the engineering societies unless we separate the first-year men into the various branches. This would force these students to do the very thing that the engineering faculties feel it not wise for them to do. A general society composed of a union of all the student branches could take in the freshmen and would be in accordance with college organization.

"Although for the first three years the engineering course is almost the same for all the various branches of engineering, and the principles of engineering are the same for all departments, it is difficult to make the students realize that the principles are the same. They tend toward specialization, for each student—in civil, mechanical or electrical engineering—likes to feel that his particular branch of engineering is distinctly different from the other branches. He does not realize that they are fundamentally alike, and that a great many problems that come to the engineer are the same for all classifications. We all know that many students graduated as mechanical engineers practice electrical engineering, and vice versa. A civil engineer of national reputation tells me that the best civil engineer he ever had in his office was a graduate of an electrical department. It is for this and other reasons that it is generally agreed among men experienced in matters of education that specialization in the first four years of the college course should be limited as much as possible.

"It seems unfortunate that our large engineering societies should foster in the students the spirit of specialization and should not make provision, in the charters of the college branches, for a combination of the various undergraduate organizations. I believe the national societies should get together and provide for the coördination of student branches at any college. The effect would be to unify the engineering profession."

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Proposes Circular Girder Support for Swingbridge Turntable

Sir—In your issue of Apr. 18, on p. 775, the failure of wheels and drum stiffeners on an important highway drawbridge near New York is described and a remedy is proposed. I do not know anything about this bridge, but would venture a guess that the real cause of the trouble is not hinted at in the article. I think that the whole trouble is in the lower track, and until that is remedied the difficulty will continue.

It has always been a mystery to me why, after so much care had been taken to line up the bottom of the drum and the upper track by careful planing in the shop, the bottom track should be made of a lot of short pieces of casting laid on uncertain masonry by the necessarily imperfect methods of field work. In *Engineering News* of Dec. 20, 1906, I recommended that the lower track for a rim-bearing drawspan be fitted to a circular girder planed on the top, as the drum is planed on the under side, and that this circular girder be placed on the pier and carefully leveled and then concreted and grouted in. There is no doubt whatever in my mind that if this had been done in the case of this bridge there would have been no trouble.

It is the wobbling of the wheels that has given rise to their breaking and to the bending up of the outer edges of the upper tracks and the buckling of the outer edges of the stiffeners. To my mind it is inconceivable that these effects could have happened from any other cause, and the introduction of extra wheels and the strengthening of the stiffeners can only serve to minimize the trouble: it will not eliminate it, unless the lower track is improved.

EDWARD GODFREY.

Pittsburgh.

Engineer Builds Business on Friendship

Sir—"Anybody here going to X.?" said a young engineer to a group of traveling men lining the lobby of a middle west small town hotel.

Investigation showed that a consulting engineer had instructed his assistants, who were all supplied with cars and traveled in them between jobs if the latter were at all close together, always to inquire at hotels for possible traveling mates before leaving for other towns, to carry men without charge as a courtesy, and to let it stand as such, and not to talk about the work in hand unless questioned. "My name as an engineer is on all my cars, however, and I consider that it creates a better feeling among laymen toward all engineers, even though no business acquaintances are made," said the consulting engineer. More of this engineer's business methods of building a clientèle, some of which worked and some of which did not, are as follows:

For the first year after opening an office he carried a card in the daily papers. Nothing ever came of it. Toward the end of the year a dignified announcement was sent to a selected list of city officials of the state. Not a reply came back. Notices of about 50 pieces of work contemplated were obtained, and a letter was sent to the officials in charge requesting interviews. Two inquiries resulted and the work was obtained. The city council was told frankly of past experiences and a try-out was asked for, not on a cheap fee, but at $25 per day.

Personal questions, as detailed below, were put to the engineer, for he is typical of a large number of the younger consulting engineers about whom much idle talk is indulged in, concerning so-called unethical procedures used to get business.

"Do you not do a lot of uncompensated promotion work?"

"Never; we do not go after work until we are certain the clients are nearly ready to talk business, and then we do not let the case alone until we or someone else gets it."

"What is the first move made in getting into a city where you have not operated previously?"

"I attended the state university. Friends made there are now men of affairs scattered all over the state. I keep in touch with them and when I hear of contemplated work in their towns I ask them to tell the city officials about me and my work."

"Does this not embarrass your friends?"

"It would were I not well established, with a reputation and plenty of work well done to which reference can be made. It is surprising how many of one's old-time friends are pleased to learn that services of someone they know are available."

"Do you get repeat orders?"

"Many of them, and there is no place where work has been done to which we cannot refer. As a square deal is given all around, my work has plenty of contractors bidding on it, a fact which helps in closing contracts."

"Do you carry around a bound volume of photographs of work done or have you reprints of technical articles descriptive of them to hand out to prospects?"

"No, but we have available a mimeograph reference list of all the principal works built since we started in business."

"Are you busy now?"

"Yes, completing work under way for some time, but we are taking no new work and a request to investigate prospective work beyond the limits of our territory, 350 miles, was refused recently."

"Do you close contracts yourself?"

"I used to, but have now a young man of fine address who can impress the prospect with his sincerity and the integrity of the firm. He never makes a promise he cannot live up to, and he is usually successful."

"Does he travel indiscriminately?"

"Absolutely, no. He goes only where business is in prospect in the immediate future."

"How much of an expense account for 'mixing purposes' is required?"

"Not a cent. No member of our organization drinks and not even cigars are dispensed."

"Do you attempt to make a prospective client recall your personality?"

"No; I do not wear conspicuous clothing, cultivate

any mannerisms, nor am I conscious of any such practice."

"Are you active and popular in your local engineering society, where acquaintances would be made and possibly expert work passed back and forth to a certain extent?"

"There is no local society here, although we have about fifty engineers and a dozen consulting firms. Many of them seem to be jealous of their brother engineers. We need an undisputed leader. A society with proper aims would engender better feeling and save the profession as a whole much of the opprobrium it now gets from personal criticisms, when tactful expressions of differences of professional opinions are needed."

"How do you extend your list of acquaintances? Do you always call on the mayor when you visit a new town?"

"No, but I invariably call on the city engineer. If I do see the mayor, shop talk is tabooed. I do not talk shop among my club friends any more than a doctor discusses his patients. Vacations are spent at places where men of affairs may be met, but no mention of my profession is ever brought up unless I am pressed by the other party. There is then a decided advantage when the same person is met in a business way, for he has no recollections of any bald attempts to push business." INTER NOS.

Poems vs. Blueprints

SIR—One day I received from a friend, an alleged poet, proof sheets of his latest wrestle with the Muse, with a request to proof-read and return them. The postage was one cent. I called him down for spelling soap "s-o-p-e" and trying to make "kaiser" rhyme with "geezer," and returned the sheets with the call-down for another cent; the assumption being, I presume, that the promotion of literature should be encouraged as contributing to the general knowledge and welfare of mankind.

The next day I received for examination and approval (or otherwise) some blueprints of shop drawings of engineering work which would cost a very large sum of money, and on the strength and correctness of which would depend the lives of many thousands of persons for many years. I found the drawings all right and sent half of them back marked "Approved." It cost four cents postage to send them and twelve cents to return half of them, because the added word changed them to first-class matter.

The manifest absurdity of the whole affair was such that I asked the Post Office Department about it, setting forth that the examination and correctness of such sheets is essentially the same as the correction of proof sheets, and that an approval or correction marked thereon and in no sense a personal communication should not change the classification any more than it does in the case of proof sheets.

Of course, the boss of the Post Office Department never saw or heard of such a letter. How could he? The way such things are handled in a public department is this: (I know, for I have held down a job in one of them.) When such a letter comes in, the head clerk or whoever it is who opens and reads letters refers it to someone for an answer. This one passes it along to someone else if he can find any excuse for doing so, and he to another, and so on and so forth, each one trying to "pass the buck" to someone else and avoid committing himself, until it finally hits someone who can't dodge, and then you get an answer. In this case the third assistant postmaster general was the goat. I would give you his name, but it looks more like a seismograph record than a signature, and is not printed anywhere on his letter head, so I do not know what it is meant for. But his title, "third assistant postmaster general," is printed in full in good, plain typewriting, so there is no doubt about it. Well, the answer of the third assistant postmaster general was that the word "Approved," with date and signature, or, the words, "Drill half holes for drainage," written on a blueprint, will subject it, when sent through the mails, to postage at first-class rates.

We all know, since Sir Joseph Porter's time, that official utterances are generally considered unanswerable, and, moreover, it is risky business these days to offer any criticism on a public official—but really, Mr. Editor, don't you think you might feel inclined to concur if you heard a well rounded opinion of the third assistant postmaster general? CHARLES F. STOWELL.

Albany, N. Y.

Engineers Have Own Labor Problem?

Sir—There are certain tendencies developing in the ranks of engineers that should be fully realized by every man of the profession. If not, the result will be much misunderstanding and inefficiency. These tendencies have their root in economic conditions, and manifest themselves in the attempts of the younger, less experienced and less prominent engineers to form organizations to protect themselves and to better themselves financially—that is, by unionizing. The responsibility for this unwelcomed tendency must rest with the more successful and prominent men of the profession.

As was ably pointed out in an editorial in *Engineering News-Record* of Jan. 3, entitled, "Labor—Shall it Be War or Partnership?", the engineer is the creator of the present industrial order. The industrial system of the eighteenth century was the result of the coöperation of an investing, a managing and a laboring class. With the development of science and its application generally to environment, the managerial class especially has undergone a significant change. In this class three groups may now be observed—one concerned principally with administration, another with engineering, and the third with administration and engineering.

Scientific management has now passed the experimental stage, and the division of an industrial organization into line and staff workers is the most modern method of procedure. The engineer, because of his specialized training, belongs to the class of staff workers and, in fact, is the very brains of production. It is a vital concern that, within this organization, coördination be perfected and mutual confidence insured.

It is not far from right to assume, as has already been pointed out, that a serious mistake was made in classing both labor and material simply as elements that entered into the processes of production, overlooking the fact

that labor had intelligence. The reaction from this blunder has been the source of bitter antagonisms between capital and labor and the loss of much mutual sympathy and possible coöperation. In the resulting conflict labor has won many advantages in the way of higher wages, shorter hours and better working conditions, and is daily becoming more and more conscious of its great power in the economic world.

Of the three groups into which the managerial class has been divided, that which has to do purely with engineering matters is the one more directly influenced by the changes that are taking place in the labor world. Of all those who have to do with production, this group is paid most poorly and protected least. It does not share the more comfortable perquisites of the administrative group, neither has it the protection of the powerful labor unions. The pinch of economic exigencies is forcing this group to effect a readjustment to its environment. Shall it ally itself with labor, a purely line factor, or with administrative engineers, constituting the staff factor? Engineering cost is the least portion of the cost of production. An increase of 50 per cent. in salaries to underpaid engineers would affect very little the total cost of production.

Much remains to be done by the engineer higher up before this tendency is arrested. These things, however, he must do: Discard the antiquated practice of regulating the salaries of engineers on the basis of the supply of and demand for engineers; discontinue the senseless cant about "patent merit" when one is concerned with the question of bare existence; and, finally, remember that an engineer's training represents considerable invested capital. There would be plenty of room even then for the regulation of salaries in accordance with individual training, experience and ability. The employing engineer would still command the respect and confidence of his less fortunate confrères and effect a more efficient coördination within the fold. Otherwise, we shall soon see in the drafting room and in the field the working of the unreasoning fiat of unionism, against which the employing engineer will not dare raise his hand. If the engineer is not able to solve this particular problem in his own ranks, is there much hope of his coping efficiently with the exigencies of the larger problem now confronting capital and labor?

Chicago, Ill. CHARLES S. DUKE.

Hillsborough County Bond Issue

Sir—In your issue of Apr. 11 is an editorial article which is very unjust to Hillsborough County, Florida, and to one of our most patriotic citizens, James G. Yeats, chairman of the board of county commissioners. The roads which it is proposed to build with this bond issue may be used by pleasure automobiles, but primarily they are for business traffic, and, owing to congestion of railroads and reduced train service, will carry a daily average of hundreds of tons of goods and farm products, mostly perishable, which would otherwise be lost. These roads are main highways, connecting Tampa, the metropolis of this section of Florida, with adjoining counties, which are now expending large sums to reach the lines of this county, while we are now wasting more than the total interest on the proposed bonds to keep our roads in barely passable condition.

Bids for this work were opened Oct. 16, 1917, and contracts awarded contingent on the result of an election held Dec. 18, 1917, which was favorable. As frequently happens to any proposed public improvement there was opposition, and the sale of the bonds was somewhat delayed by a temporary injunction, but a second sale was effected, the bonds were sold and the contracts completed before the appointment of the Capital Issues Committee. Secretary McAdoo stated that this committee would have no power in the case of issues authorized before its creation, and its approval was sought only as a courtesy. The home opposition factions had been at work and the commissioners were surprised that approval was withheld. It had already been resolved not to accept any money on the bonds or begin any expenditures until the third Liberty Loan was completed, and Mr. Yeats, as a member of the Hillsborough county committee, is now devoting all his time and energy to the national loan with the same zeal and patriotism he has displayed in his efforts to help the county, state and nation by the construction of urgently needed commerce-bearing highways.

F. E. BRYAN,
President of the Board of Trade.
D. B. MCKAY,
Mayor of Tampa.
CLYDE GLENN,
President of the Hillsborough County Board of Trade.
FRED WOLF,
President of the Tampa Merchants' Association.
LOUIS A. BOYLE,
President of the Citizens' Bank & Trust Co.
W. B. GRAY,
President Tampa Realties Association.

Tampa, Fla.

[The above statement confirms, in detail, over the signatures of the men concerned, the facts outlined (in the editorial on page 691 of *Engineering News-Record* for Apr. 11) as having been reported in connection with the road bond issue. These facts are, first, that the Hillsborough County road bond issue was submitted, for whatever reason, to the Capital Issues Committee; that the Capital Issues Committee deemed the roads to be unnecessary and withheld its approval of the project; and, third, that the local authorities went ahead in defiance of the Capital Issues Committee to sell the bonds and build the roads. Moreover, the justification for this procedure advanced above—that the roads would carry a large amount of freight—is not supported by any definite statement of the amount of traffic that might develop, nor is it said that a study of such traffic has even been made.

Were this the case, however, the patriotic course, in the opinion of this journal, would still have been to fight the matter out before the Capital Issues Committee, instead of taking advantage of the fact that the committee had no direct authority in this case to enforce its opinion, and thus set a bad example to many hundreds of other public bodies over the country which are having their less essential projects deferred by the Government.—Editor.]

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Shooting Concrete Into Tunnel Which Is Under Air Pressure

PNEUMATIC placing of concrete inside a tunnel which is being built under air involves some difficulties in the possible release of pressure through the delivery pipe. How the problem was solved on some sewer tunnels in Memphis, Tenn., is told by H. B. Kirkland in a recent paper read before the Western Scciety of Engineers. On one of the tunnels the pneumatic mixed was located outside of the tunnel, and the discharge pipe was built through the lock and carried through the tunnel to the forms at the heading. At the end of the discharge pipe and the top of the form a flap valve was placed, so that when the mixer was blowing the valve would lift, and when the air was shut off it would close by its own weight and the air pressure within the tunnel held in place. This was not quite satisfactory, however, as the flap of the valve would occasionally not seat itself, due to the presence of particles of concrete, so temporarily a man was posted there with a wooden paddle to place over the end of the pipe as soon as the discharge ceased.

On the other job the mixer was located inside the air pressure section and a drop pipe led to it from the surface. At the top of this drop pipe a material lock was placed so that each batch was locked into the drop pipe.

Turntable Saves Time for Motor Trucks

TURNTABLES are used in the logging country of the Northwest to turn large motor trucks, especially when a trailer is attached. To do this in the ordinary way requires considerable time, and it is often hard to find sufficient space for the operation. The large Kelly-Springfield outfit, consisting of a five-ton truck and trailer, which is shown in the photograph, can be easily turned in a space 40 ft. in diameter by one man in a few minutes.

YOUR IDEAS CAN HELP WIN THIS WAR

You seldom stop to think how much your ideas are really worth—you're too busy with the day's work.

Yet every little problem you solve is just so much contributed to the winning of this tremendous conflict.

For the effectiveness of the organization behind the lines and at home is vital to the effectiveness of man-power at the front.

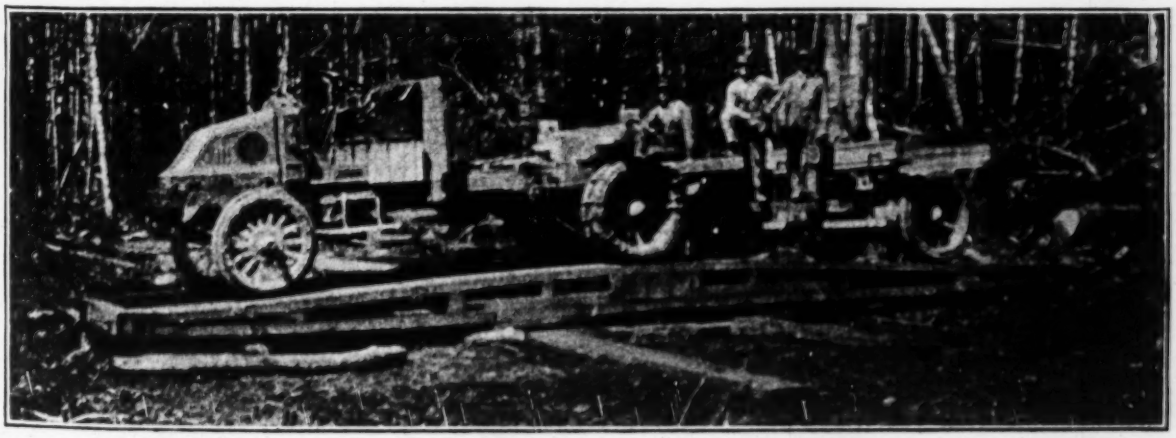
You are doing your share every day—but are you helping the other fellow and the country by telling him your good ideas?

Tell your friends on other jobs—then multiply that a thousand fold by telling the contracting fraternity through

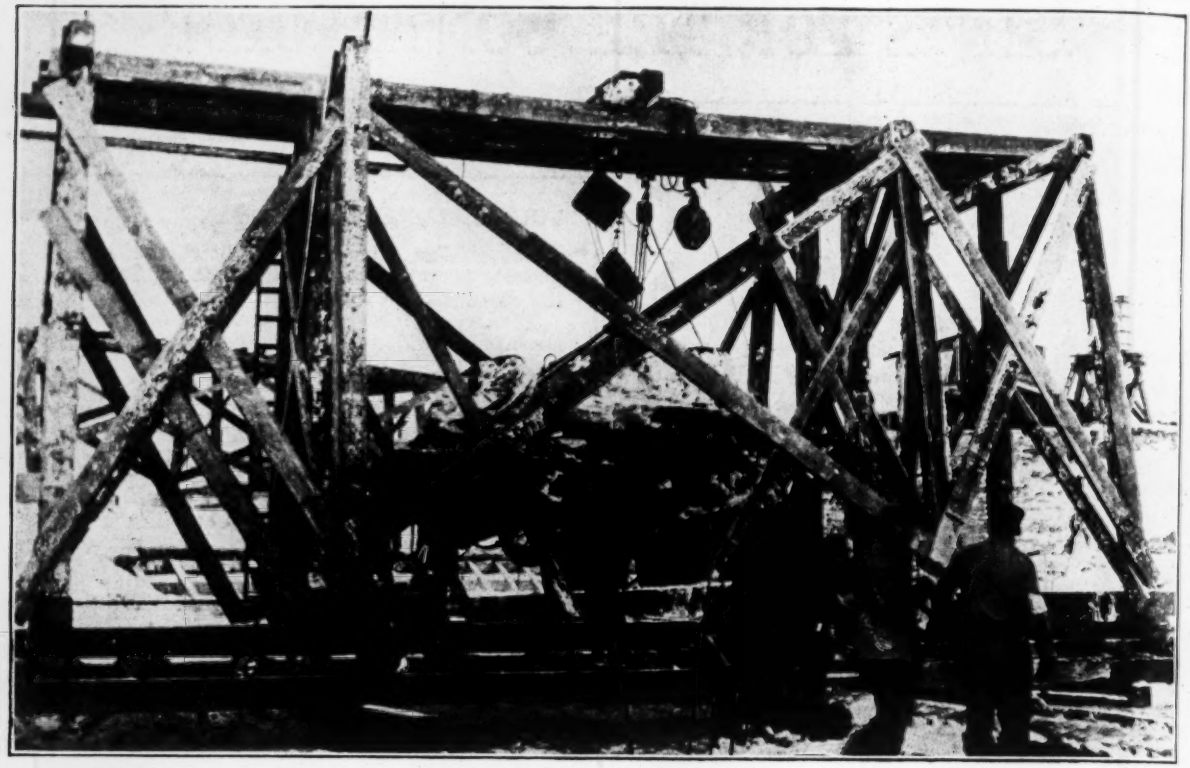
HINTS FOR THE CONTRACTOR

The turntable was constructed of timber by laying two 12 x 12-in. timbers on a fairly level piece of ground. bedded with their tops flush with the surface and 6 ft. apart. Upon this as a foundation a seat was laid consisting of five 12 x 12-in. timbers 8 ft. long fastened securely together. The base of the platform, which turns upon the above seat, was also composed of five 12 x 12-in. timbers joined in a similar manner. To this base the platform was made secure. Steel plates ¼-in. thick and 3 ft. in diameter were attached to the base and seat, thus forming a bearing at the turning surface. A steel pin 2 in. in diameter, passing through prepared holes in the bearing plates, formed the pivot for the table.

Upon the turntable base a platform was built 8 ft. wide and 35 ft. long, the floor being composed of 4-in. plank laid lengthwise of the driveway and extending from end to end without a joint. It was arched at the center and well spiked to the supporting joists. Two planks placed at each side are trussed with a steel cable



TURNTABLES FOR TURNING FIVE-TON TRUCK AND TRAILER CLEAR GROUND AT LEAST A FOOT



TRAVELER RAISED TRACTOR AND CONVEYED IT TO THE SHORE—TACKLE AND ROLLERS ARE SHOWN IN PLACE

and turnbuckle, which stiffens the structure lengthwise. It is desirable to have a clearance of about 1 ft. to allow for unevenness in the ground, and this makes necessary an inclined approach.

Steam Tractor Raised Through Ice from Six Feet of Water

By A. A. Whitmore
Junior Engineer, United States Reclamation Service

RAISING a Case steam tractor through a hole in the ice was a problem which had to be solved at the Dodson dam of the United States Reclamation Service's Milk River project. A heavy flood caused the tractor to tip from the crib supporting it and fall into the river. When the flood subsided it was found resting on its side in about six feet of water, and only a small portion of its front and rear wheels projected above the surface.

Considerable time passed before anything was done to raise it, and in the meantime about one foot of ice had formed. Holes were cut and 10 x 10 in. posts were set upright on the bottom of the river, sawed off about one foot above the ice, and capped. Upon these caps eight 10 x 10 in. stringers, four on each side, were placed and fastened with drift pins. The ice which soon formed around the posts gave sufficient bracing.

The traveler was next built upon this staging with the rollers in place, as shown in the photograph, and anchored down to the caps with cable. The timber, used because it was available, was 10 x 10 in. and the bracing was 2 x 10 in. plank. In the absence of double steel cable blocks, the lifting was done with single blocks used in pairs, and the falls were passed over the drums of a hoisting engine on the bank.

When the tractor had been lifted sufficiently, timbers were placed across the sills of the traveler to support it, as shown in the illustration, the anchors were slackened, and the traveler was rolled to the shore.

New Rivet-Driving Records in Ship Work

Figures just reported to the Emergency Fleet Corporation show speed records in rivet driving rapidly mounting. Since the widely published record made by a riveter named Schock at the Baltimore Dry Dock & Shipbuilding Co. plant, a few weeks ago, in driving 2720 ¾-in. snap rivets in the floors of an 8800-ton steamer in a nine-hour day, a larger number of rivets was driven in a shorter day at the Kearny plant of the Federal Shipbuilding Co. On April 26 Edward Gibson and gang drove 2919 rivets in eight hours, or 365 an hour. Not long before, a remarkable performance on countersunk shell rivets was made at the American Shipbuilding Co.'s Buffalo yard, when 2089 rivets of ¾-in. diameter were driven in 8½ hours.

Two new figures reported to the Emergency Fleet Corporation surpass those quoted by a large margin, though one of these is shop-rivet work. M. R. Knox and gang drove over 4000 rivets on ship floors in the fabricating shop of the Northwest Steel Co. at Portland, Ore. Of these 3865 were ¾-in. rivets and 224 were ⅞-in. rivets. In addition two rivets were cut out, so that the official figure is 4091 rivets. The total working time was nine hours. On hull work C. Knight, at the Baltimore Dry Dock Co.'s yard, using a double gang—two holders, two passers, two heaters and two rivet boys—drove 4875 ¾-in. rivets in nine hours.

Records are being broken every day, it is said at the office of the Emergency Fleet Corporation.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Water-Works Men Meet at St. Louis

Annual Convention of American Water-Works Association Amends Constitution—Superintendents Have Their Day—Cast-Iron Pipe Specifications Advanced

Features of the 38th annual convention of the American Water-Works Association held at St. Louis last week were the adoption of amendments to the constitution, hearty support for the majority members of the committee on revising standard specifications for cast-iron pipe, association action to aid in placing utility operators at army camps, and a superintendents' day not broken into by extraneous matters.

An ample but not overcrowded program of papers was provided. Committee reports were notable by their absence. An atmosphere of harmony prevailed which was a marked contrast with that of the convention at Richmond a year ago. The limiting of the exhibits by war-time transportation conditions was cheerfully accepted. The convention attendance was considerably larger than was anticipated, the total registration reaching 750.

President Leisen's Address

Maj. Theodore A. Leisen, retiring president of the association, was able to spend only one day at the convention. In the course of his brief address he said:

"One of the principal lines of service which this association should endeavor to render at this time is coöperative assistance through proper channels in obtaining fuel and other commodities essential to the continuous and efficient operation of water-works. The first move in this direction, affiliation with the national committee on gas and electric service, was productive of considerable good, but there was an apparent lack of effort to take full advantage of this committee's facilities and services, or much better results might be recorded. Other steps tending to effect these results are now under contemplation and it is hoped that the combined efforts along these lines will afford marked relief in obtaining prompt deliveries of coal and other supplies to all water-works administrations."

Constitutional Amendments Adopted

Four amendments to the constitution were adopted with but little discussion. They remove the bar which has heretofore excluded from active membership technical men employed by associate members of the association; provide new and rather elaborate procedure for the nomination and election of a nominating committee; create a convention committee; and clarify old provisions relating to contributions by the association to the funds of local sections.

Interest centered in the nominating committee amendment which was discussed widely.

The fourth and final amendment adopted authorizes payment to local sections of not more than 25% of the dues paid by members of local sections, except that sections with small membership may receive up to $50 and that no section shall be paid more than $150 from the association funds.

The four amendments were framed by an advisory committee consisting of George A. Johnson, chairman; Morris R. Sherrerd, Carleton E. Davis, Garrett O. House and Edward E. Wall. With slight amendments they were approved by the executive committee.

Essential and Priority Lists

Prior to the convention a "resolution" was sent by the executive committee to the members of the association, with notice that it would come up for discussion at the convention. It consisted of eight "whereases" reciting war-time difficulties of the water-works of the country, such as increasing expenses, need for higher rates, etc., but included no resolution beyond a declaration that the "whereases" should be laid before the members. When the subject was brought up for discussion, George A. Johnson, chairman of the executive committee, offered in place of the "resolution" a letter to be sent in the name of the association to Secretary McAdoo, setting forth briefly the difficulties the members experienced last year in getting deliveries of water-works materials, appending a list of essentials and requesting that they be given all reasonable priority in shipments.

Army Camp Utility Operators

Acting on suggestions from George W. Fuller and others regarding the need for competent men to serve in various grades as operators of utilities at army camps a committee was appointed to deal with the matter. It was composed of W. S. Cramer, Lexington, Ky., Frank C. Jordan, Indianapolis, and Charles R. Henderson, Davenport, Iowa, president-elect of the association. The committee prepared an application blank for members of the association to fill and send to Lieut. Col. S. D. Hartman, 7th and C Sts., S. W., Washington, D. C.

(Continued on page 1018)

Concrete Freighter "Faith" Has Tryout in Rough Sea

The concrete steamship "Faith" on May 15 made a trip to the Farralone Islands, 30 miles offshore from San Francisco, in order that further tests might be made in a rough sea. The boat went out against a head wind and encountered large rollers outside. Reports of Government officials and navigators who were on board are enthusiastic, and it is said that the boat rode as lightly and was handled as easily as any steel steamship. On May 16 the "Faith" began loading a cargo of salt for Vancouver, B. C., after which a trip to Honolulu is to be made, it is announced.

Government officials are now at San Francisco looking over sites on San Francisco Bay for the location of a concrete shipyard for the United States Shipping Board.

First Boat Goes Through Western Branch of Barge Canal

On Friday, May 17, the first boat passed through the western section of the New York State Barge Canal extending from north of Syracuse to the Niagara River. The eastern sections, which connect Lake Ontario at Oswego and Lake Champlain at Whitehall with the Hudson River above Troy, were completed last summer and were put into use again this season on May 15. Some work still remains on the western section in removing obstructions and widening the channel, but navigation is now possible over the whole canal route. Formal celebration of the completion of the canal will take place, it is expected, July 4.

Hog Island Crew Drives 165 Piles in Less Than Ten Hours

One hundred and sixty-five wooden piles were driven in 9¼ hours by a Hog Island crew headed by Robert Sutton, according to a statement issued by the Raymond Concrete Pile Co., which holds the contracts for ten shipways of Group No. 2. The previous best record was made by another crew at Hog Island, under William Gordon, which drove 140 piles in the same time.

Russian Engineers Tour Country to Study American Roads

A delegation from the Russian Mission of Ways of Communication, which has its headquarters in New York, expects to make an automobile tour of the United States to study American methods of road construction and maintenance, leaving New York City in the latter part of May and not re-

turning until July. The party, which consists of O. V. Lomonossoff, president of the mission, E. S. Zack, chief of the highway department of the mission, and W. D. Almazov, assistant chief of that department, will motor to San Francisco over the Lincoln Highway, proceed up the coast to Seattle, and return through Montana, South Dakota, Minnesota and Wisconsin to Chicago, taking the route through the Mohawk Valley on the return to New York.

German Drive Makes Travel In France Harder

More Prisoners Needed, R. K. Tomlin Finds, Before Engineer Privates Can all Be Foremen

Since the big German drive started transportation has been exceedingly difficult, and on my last trip I had quite a job to get from one place to another and to find quarters at night, says R. K. Tomlin, war correspondent of *Engineering News-Record*. This matter is a very serious one from the point of view of the visiting correspondent, as practically every French town in the zone occuppied by the American forces, from the front line trenches to the coast, is so chock full of men that all available living quarters are occupied. I have landed in several towns and faced the prospect of walking the streets all night, but luckily at the last minute I have found a place to sleep. I will not burden you with further details along this line except to say that the correspondent in France these days has to do a lot more than write.

During my visit to the road work in the advance section, I saw Acheson [W. M. Acheson, formerly division engineer, New York State Highway Department, at Syracuse] who wanted me to give you his kindest regards. I have in prospect a great amount of material. There are at present from a dozen to twenty jobs which I should be covering, many of these involving long trips from Paris. I am trying to line them up as fast as possible.

Engineering work by the Army is now striking its stride, and the progress being made appears very hopeful. Still, in going around from one place to the other, it seems to me that our big need now is for labor. We have more than enough supervising talent. The big thing is to find men to do the manual labor jobs, to handle pick and shovel, and crush rock. Of course we shall have to capture many German prisoners before we can assign men to superintend their work.

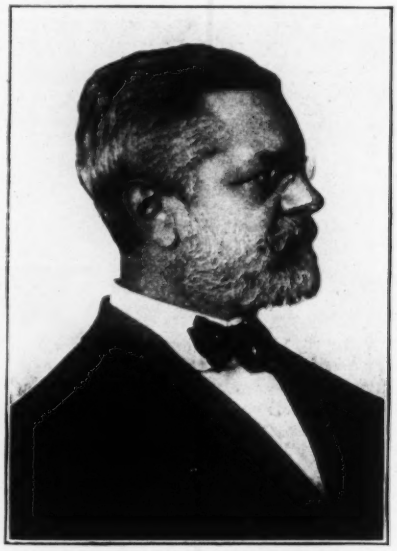
Memorial to Major Powell Dedicated at Grand Canyon

On May 20 Franklin K. Lane, secretary of the interior, dedicated a tablet erected at the rim of the Grand Canyon in Arizona to Maj. John Wesley Powell, director of the United States Geological Survey from 1881 to 1891, who first surveyed the canyon and who made two historic trips through it in rowboats, one in 1869 and the other in 1871.

Former Trustee and Secretary of United Engineering Society

Prof. F. R. Hutton, whose death was briefly noted by this journal last week, was one of the prime movers in establishing the United Engineering Society and was for two years a director and for a much longer time the secretary of that organization, which brought together the national engineering societies of this country. The following appreciation of his work was written by Charles Whiting Baker:

It was with a deep sense of personal loss that hundreds of engineers read last week the announcement of the



FREDERICK REMSEN HUTTON
Noted engineer, who died last week, was instrumental in uniting national societies

sudden death of Prof. Frederick Remsen Hutton. Few men in the engineering profession ever won a wider circle of friends or contributed in larger measure toward the solidarity of the profession by promoting acquaintanceship and cordial relations among its members.

Professor Hutton was a native of New York City, and his active life, wholly spent there, was chiefly centered about two great institutions—Columbia University and the American Society of Mechanical Engineers. Each of these owes a great and lasting debt to him.

After being graduated from the arts course in Columbia University in 1873 and from its School of Mines in 1876, he began work at once as an instructor, and a year later became an associate of the late Prof. W. P. Trowbridge in teaching mechanical engineering. That year marked the first recognition at Columbia of mechanical engineering as a separate branch of engineering instruction.

The young instructor was promoted to a professorship five years later, and in 1892 became the head of the mechanical engineering department. He held that position for 15 years, until his resignation and appointment as professor emeritus in 1907. For six years during this time he was also dean of the faculty of applied science.

It is the personal and social qualities of the man himself that bulk largest as one reviews his quarter century of distinguished service to the American Society of Mechanical Engineers. The men who founded that society showed keen insight when they selected as its secretary, in 1883, only three years after its organization, a young and unknown assistant teacher at Columbia. Professor Hutton had a genius for the cultivation of friendship.

After nearly a quarter century in the secretary's office, Professor Hutton's great service to the society was fittingly recognized by his election as its president in 1907. After that time, also, in service on the council and on its working committees, Professor Hutton continued to play a large part; and the title of honorary secretary bestowed on him for life by the council was not an empty one.

Besides his work, briefly summarized above, for these two great institutions, Professor Hutton found time for valuable contributions to the literature of his profession. Three of his works which have been used as textbooks are "The Mechanical Engineering of Power Plants," "Heat and Heat Engines," and "The Gas Engine." He was a frequent contributor to the society's transactions and to other technical literature, and a collaborator in the preparation of such standard works as the Century dictionary, Johnson's encyclopedia, and the International cyclopedia.

In the field of practical engineering work he served in 1911 as consulting engineer to the Department of Water-Supply, Gas and Electricity, New York City, and had been consulting engineer to the Automobile Club of America since 1912. His interest in social and industrial betterment was exemplified by the service which he rendered to the American Museum of Safety.

In that great enterprise for the benefit of the whole engineering profession—the construction of the splendid home for the national engineering societies on West 39th St., in New York City—Professor Hutton was one of the few responsible for its origin and development.

But the chief tribute to his memory which, conscious or unconscious, will ascend from the hearts of hundreds of his former students and his professional associates, will be that their lives are the richer for having known him.

Indiana State Highway Commission Lays off Engineers

Practically the entire engineering force of the Indiana State Highway Commission has been laid off, on account of the ruling of Judge Cloe of the Hamilton County Circuit Court. The

decision, which was reported in last week's issue of this journal, if sustained by the higher court will declare the highway law unconstitutional.

Under the circumstances it was inadvisable to proceed with the work, and practically the entire force, consisting of 38 engineers and draftsmen, was laid off. The Supreme Court adjourns for its vacation on July 1 and a decision is not expected until some time this fall, too late for any work this season.

Shipyard Housing Put Under New Director

A. Merritt Taylor Made Head of Division Which Includes Transportation and Provision of Quarters

Housing and transportation, which heretofore have been in charge of separate branches of the Emergency Fleet Corporation, have been merged into one department, to be known as the Division of Passenger Transportation and Housing, with A. Merritt Taylor as director. Mr. Taylor has been at the head of the Passenger Service Section, whose activities have been described in *Engineering News-Record* of Apr. 18, p. 790, and May 9, p. 923.

Appointments by Mr. Taylor include J. Willison Smith, an assistant director of housing, and J. Rogers Flannery, as associate director of housing. Garrett T. Seely continues to handle passenger transportation problems under the title of assistant director of passenger transportation.

World's Largest Building in New Port Terminal

Government Development at Brooklyn One of Several Huge Schemes for Overseas Transport

Announcement made last week of the letting of the contract for the new Government port terminal at South Brooklyn, in New York Harbor, adds another to the list of large port developments now under way for the overseas transportation of supplies to the American troops in France. Earlier in the war a number of terminal warehouses of temporary construction were built, speed being then essential. Of late, however, several large projects have been initiated in which a permanent type of structure has been designed, although speed has not by any means been made a minor consideration.

These large terminal developments at Boston, Charleston, S. C., Baltimore, and now at Brooklyn, rank among the largest port and railway terminal projects in the world. The New York base, contracts for which have just been let, is, in fact, the largest thing of its kind ever projected. The director of storage transportation and purchase, Maj.-Gen. G. W. Goethals, has worked out all of the schemes for overseas transport, but military restrictions do not permit at present a full statement of the plans. The contract between the Government and the Turner Construction Co., New York, for the South Brooklyn base has, however, been made public.

Plans for this base have been prepared by Cass Gilbert, New York architect, under General Goethals' direction. It contemplates the erection of the largest building ever constructed, with 6,000,000 sq.ft. of floor under one roof. The terminal is located on the South Brooklyn shore of New York Harbor, between 58th and 65th Streets. It contains a reinforced-concrete building approximately 1000 feet square, from 8 to 9 stories high, besides three double deck piers 1300 ft. long and 150 ft. wide, and a one-story lighterage pier 1350 x 70 ft. Connection with the railway lines of Long Island are to be made through a yard containing about 13 miles of track.

Work is immediately to be started under the direction of the construction division, U. S. A. The contractor expects to give the Government partial use of the building by the end of 1918, and to complete the entire project by a year from now.

National Research Council Made Permanent

President Wilson Authorizes Government Representation on Body To Co-ordinate Sciences

By a special executive order dated May 11, President Wilson gave his official approval to the National Research Council, which has been at work on scientific coördination for more than a year. The main part of the order is as follows:

"The National Research Council was organized at the request of the President by the National Academy of Sciences, as a measure of national preparedness. The work accomplished by the council in organizing research and in securing coöperation of military and civilian agencies in the solution of military problems demonstrates its capacity for larger service. The National Academy of Sciences is therefore requested to perpetuate the National Research Council, the duties of which shall be as follows:

"1. In general, to stimulate research in the mathematical, physical, and biological sciences, and in the application of these sciences to engineering, agriculture, medicine, and other useful arts, with the object of increasing knowledge, of strengthening the national defense, and of contributing in other ways to the public welfare.

"2. To survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with these projects.

"3. To promote coöperation in research, at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress; but in all coöperative undertakings to give encouragement to individual initiative as fundamentally important to the advancement of science.

"4. To serve as a means of bringing American and foreign investigators into active coöperation with the scientific and technical services of the War and Navy Departments and with those of the civil branches of the Government.

"5. To direct the attention of scientific and technical investigators to the present importance of military and industrial problems in connection with the war, and to aid in the solution of these problems by organizing specific researches.

"6. To gather and collate scientific and technical information, at home and abroad, in coöperation with governmental and other agencies, and to render such information available to duly accredited persons.

"Effective prosecution of the council's work requires the cordial collaboration of the scientific and technical branches of the Government, both military and civil. To this end representatives of the Government, upon the nomination of the National Academy of Sciences, will be designated by the President as members of the council, as heretofore, and the heads of the departments immediately concerned will continue to coöperate in every way that may be required."

Military Instruction for Students

The Secretary of War has authorized the following statement:

In order to provide military instruction for the college students of the country during the present emergency, a comprehensive plan will be put in effect by the War Department, beginning with the next college year, in September, 1918. The details remain to be worked out, but in general the plan will be as follows:

Military instruction under officers and noncommissioned officers of the Army will be provided in every institution of college grade, which enrolls for the instruction 100 or more able-bodied students over the age of eighteen. The necessary military equipment will, so far as possible, be provided by the Government. A military training unit will be created at each institution. Enlistment will be purely voluntary, but all students over the age of 18 will be encouraged to enlist. The enlistment will constitute the student a member of the Army of the United States, liable to active duty at the call of the President. It will, however, be the policy of the Government not to call the members of the training units to active duty until they have reached the age of twenty-one, unless urgent military necessity compels an earlier call. Students under 18 and therefore not legally eligible for enlistment, will be encouraged to enroll in the training units. Provision will be made for coördinating the Reserve Officers' Training Corps system, which exists in

about one-third of the collegiate institutions, with this broader plan.

This new policy aims to accomplish a twofold object: (1) to develop as a great military asset the large body of young men in the colleges; and (2) to prevent unnecessary and wasteful depletion of the colleges through indiscriminate volunteering, by offering to the students a definite and immediate military status.

Later announcement will be made of the details of the new system. In the meantime, presidents of collegiate institutions are requested to call this matter to the attention of all their students. Those who are not graduated this spring should be urged to continue their education and take advantage of this new opportunity to serve the nation.

American Water-Works Association Convention

(Concluded from page 1015)

The forenoon of Superintendents' Day was devoted to the subjects of frozen services, meters, mains and hydrants and high consumption records during the past winter. Many experiences were given orally and in writing, as in the talks at the New York section convention last February, reported in *Engineering News-Record* of Feb. 28, p. 434. The convention authorized the appointment of a committee to digest the mass of accumulated data on thawing services, possibly in coöperation with a like committee of the New England Water-Works Association. The American committee was requested to prepare a design and specifications for a standard portable, self-contained electric thawing machine, ample experience indicating the superiority of such apparatus in point of mobility and cost.

Cast-Iron Pipe Specifications

The deadlock between manufacturers and users of cast-iron pipe laid before the convention a year ago by the members of the committee on revision of the standard specifications was a feature of the Richmond convention. A questionnaire was authorized to determine (1) whether the members desire the specifications revised; (2) whether they favor a uniform outside diameter; (3) whether they desire the specifications to include chemical requirements; (4) whether a relation between flexure and breaking load should be specified. An identical tentative draft of specifications and questionnaire was also sent out recently by the New England Water-Works Association.

Results of the Questionnaires Favor Revision

The result of both questionnaires is presented in the accompanying table. Although the total vote by each association was light it was heavily in favor of revision, and almost as strongly for having the specifications cover the three new points already named. Edward E. Wall, water commissioner of St. Louis, and a member of the American committee suggested that the convention vote merely on whether it wanted the work of revision to proceed, or, in other words, whether the committee should be continued. Walter Wood, Philadelphia, also a member of the committee, urged that the old specifications were well suited to the average user. He said that standard specifications would have been adopted three years ago by the International Association for Testing Materials had it not been for the war. He advocated postponing action, in the interest of export trade, until an international specification could be adopted.

When the question of continuing the committee was put to a viva voce vote the ayes come out in strength and there were no audible noes. Mr. Wood then requested an immediate conference of all the manufacturers of cast-iron pipe present.

VOTE ON REVISING SPECIFICATIONS FOR CAST-IRON PIPE

	American			New England		
	Total	Yes	No	Total	Yes	No
1. Revision considered desirable	46	33	13	94	84	10
2. Uniform outside diameter	44	34	12	87	81	16
3. Chemical requirements	37	26	11	87	74	13
4. Relation between flexure and breaking load	35	29	6	76	65	11

Special Committee Reports

The majority and minority reports of the committee on depreciation, submitted a year ago, and also a large volume of discussion received during the year, were referred to a new committee. A progress report on sand analysis was submitted by Philip Burgess, chairman. The committees on standard specifications for wrought-iron pipe, classification of technical literature and city planning were discontinued. The committee on official standards of water analysis was ordered continued at the discretion of the president.

Officers and Meeting Place

The reports of the officers indicated that the affairs of the association are in good shape. With $3000 added to the permanent fund of the association during the year, bringing the fund up to $11,000, the balance in hand was $1487. The publication committee has in mind the securing of special papers and reports to increase the usefulness of the *Journal*.

The letter ballot for 1918-19 officers showed that Charles R. Henderson, Davenport, Iowa, had been elected president; Carleton E. Davis, Philadelphia, vice-president; J. M. Caird, Troy, N. Y., treasurer; A. W. Cuddeback, Paterson, N. J., and Jack J. Hinman, Jr., Iowa City, Iowa, trustees. The new executive committee continued John M. Diven, Troy, N. Y., as secretary, John M. Goodell, Washington, D. C., as editor, and made George A. Johnson, New York City, chairman of the finance committee.

Buffalo won the next convention by 114 votes against 52 for Detroit.

Charles R. Henderson, President American Water-Works Association

Charles R. Henderson, elected president of the American Water-Works Association at its convention last week in St. Louis, is manager of the Davenport Water Co., Davenport, Iowa He was born in Middlesex, England, in 1870, and came to the United States when a small boy. Early in life, at 17,

CHARLES R. HENDERSON

he entered the water-works business and was employed for 11 years by Bull, Prince & Bull, afterwards L. & W. B. Bull, proprietors of the Quincy, Ill., water-works, successively as clerk, foreman of construction and secretary. From 1898 to 1901 he was master mechanic of the Tlahualilo Co., near Torreon, Mexico, and then for three years superintendent of the Quincy plant, during which period the historical lime-and-iron treatment was developed. For the succeeding four years he was superintendent and manager of the plants at Terre Haute, Ind., and Waterloo, Iowa, in order. Both plans passed during his régime, without controversy, into municipal ownership. Since 1909 he has been at Davenport. He is genial, fair and square, a loyal friend and an indefatigable worker.

Ordnance Department Wants Technical Men

An urgent call for high-grade technical men and operatives to fill war positions in industrial establishments is made, through the Civil Service Commission, by the United States Army Ordnance Department.

Salaries ranging from $1600 to $6000 a year will be paid to the men who qualify for the places.

Chemists and chemical engineers; men experienced in the manufacture of gas; mechanical engineers on high-pressure apparatus; engineers to take charge of power houses; and foremen of machine shops are needed. Persons of military age accepting appointment will not be able to avoid, by such action, the obligations of the selective service law.

The Army Ordnance Department, in issuing its call for these men, is insisting that no applications will be accepted from Government employees or employees of firms or corporations engaged in contracts for the Government or its allies unless written assent to such application is given by the heads of the establishments.

Engineering Co-operation and War Discussed

Meeting of A. A. E. Considers Problems of Organization, Coöperation, Education, Licensing and Employment

Coördination of the activities of engineering societies occupied the greater part of the time of the fourth annual meeting of the American Association of Engineers, which was held in Chicago May 14 in conjunction with the Committee on Engineering Coöperation. The discussion elicited a variety of opinions as to means for attaining the desired unity, but in the main it pointed to a system of local and national associations represented in a central body organized to deal with matters affecting the profession as a whole.

After the opening address by the president, Edmund T. Perkins, and the address of welcome by John E. Ericson, city engineer, the meeting was divided into five sections, which held simultaneous sessions during the morning and submitted resolutions for consideration by the meeting as a whole during the afternoon session. These sections, with their chairmen, were as follows: Work of engineering societies and the licensing of engineers, W. D. Gerber; publicity given to the profession by its activities in the war, Fred R. Low, the editor of *Power;* engineering employment and the supply of technical men for war work, W. H. Finley; engineers' assistance in distribution and conservation of coal, G. W. Heald; standardizing engineering education, Prof. R. C. Yeoman.

How to Coöperate

Organization and coöperation were considered mainly in regard to engineering societies. National organization of engineers was the subject of a paper by Gardner S. Williams, consulting engineer, Ann Arbor, Mich. He favored strong State or local societies dealing with State and municipal affairs and having delegate representation in a central body organized to deal with general and national questions. This plan he considered preferable to that of a central body which cannot act without first getting permission from the subsidiary associations. He suggested that the Engineering Council might be expanded on such a basis. The organization and purposes of the Engineering Council were outlined by A. D. Flinn, its secretary.

A plan proposed by the Committee on Coöperation was presented by C. E. Drayer, Cleveland, Ohio. This advocates the strengthening and inter-relation of existing organizations, no new ones to be created in fields already occupied. Unity should be obtained by having each engineer belong to his local society, rather than by affiliation of local chapters or sections of the national societies with one another or with the local societies. Another plan, outlined by Hunter McDonald, chief engineer of the Nashville, Chattanooga & St. Louis Ry., proposed state organizations with a central government of delegates in coöperation with the Engineering Council. Separate organizations in any locality would be combined, and national societies would retain their organization and autonomy for technical purposes, but would surrender all other activities to the central body. All organization between the national or central body and the State organizations would be disbanded.

As a preliminary to Mr. McDonald's plan there would be a determination of what constitutes an engineer, and then a state census of engineers. It was shown that some technical societies, such as the American Railway Engineering Assn. and the American Waterworks Assn., have members who are not engineers, and this might introduce difficulties. Mr. McDonald pointed out that there is a great body of engineers who do not belong to any society. He estimated that there are in this country about 20,000 engineers competent to design and build engineering works.

The proposed Academy of Engineers was discussed, the general opinion of the meeting being evidently opposed to such an institution as unnecessary and planned on a wrong basis.

Other Action by the Meeting

Universal military training was indorsed. Employment of technical men for government service through the free "Public Service Reserve" established by the United States Department of Labor was urged.

Government action on increase of engineers' pay was discussed, and a telegram was sent to Mr. McAdoo, director general of railways, urging that in view of the increased cost of living such increase in pay should be based on the figures for 1918 and not on those for 1915. Desirability of the establishment of a code of ethics was brought up in a letter from Morris L. Cooke, Philadelphia. In accordance with his suggestion, Isham Randolph was requested to prepare such a code. Investigation of engineering license laws was suggested. Proposed investigation of the standardizing of engineering education was voted down, on the ground that the association funds could be used to better advantage in other ways and that a previous investigation made by the American Society of Civil Engineers produced no definite or valuable results.

The election of officers resulted as follows: President, William H. Finley, chief engineer, Chicago & North Western Ry.; first vice-president, H. W. Clausen, assistant city engineer, Chicago; second vice-president, L. K. Sherman, consulting engineer, Chicago. The secretary is A. H. Krom, 29 So. LaSalle St., Chicago.

Finley New President of American Association of Engineers

The president elected at the annual meeting of the American Association of Engineers, in Chicago, on May 14, is William H. Finley, chief engineer of the Chicago & North Western Ry. After being with the Edge Moor Iron Co. from 1882 to 1887 his railway career began in the engineering department of the Chicago, Milwaukee & St. Paul Ry. in 1887. Five years later he went to the Chicago & North Western Ry. as bridge engineer; he became assistant chief engineer in 1906 and chief engineer in 1913. His only departure from railway service was for about a year in 1905-6 when he was president and general manager of the Widell-Finley Co., engineer and contractors. Mr. Finley was born at Delaware City, Del., Jan. 22, 1862.

Oregon Engineers Ask Why Members Join

Questionnaire Sent Out by Secretary to Learn Views on Purpose and Possibilities of Society

A questionnaire addressed to members of the American Society of Civil Engineers who belong to the Portland (Ore.) Association of Members, was designed to bring out the reasons of members for belonging to the society and their views as to its purpose and possibilities. The letter, which was sent out by the secretary, C. P. Keyser, in advance of a recent meeting, follows:

"I have been instructed by President Dater to call a meeting of the association to be held at the University Club on Wednesday, May 8, 8 p. m. This will be an important meeting and a full attendance is earnestly desired.

"In order that you may give more or less preliminary consideration to matters which will be presented for discussion, I should like to ask the following impolite questions:

"Why did you join the society? Was your main motive to avail yourself of the information aforded by the publications and library, to bear the hallmark of the guild, to work for the welfare of your profession, or are you just a 'jiner?'

"Are you satisfied with what you get out of your membership? On the other hand, are you satisfied with what you put into it?

"Are you satisfied with the present

government of the society in New York? If not, would you make it more democratic (or autocratic) generally, or would you increase the governing responsibility of local units?

"Are you of the opinion that the American Society of Civil Engineers should function exclusively or principally along technical and ethical lines, leaving questions of social standing and influence to an outside, to a correlated, or to a sub-organization?

"What plan do you recommend to perfect coördination of all technical society activities?

"What form of programs for our local meetings will interest you, technical, social or general interest?

"Do you desire to enter military service?

"What are you doing toward winning the war?

"What in your opinion will be the status of engineers in Oregon after the war?

"Would you favor augmented dues if the increase spelled local service?

"Could you be induced to rendezvous with other engineers or kindred spirits, say for lunch at a stated time or place? Would you support an Engineers' Club?

"These questions are asked as a probe by the chairman of your program committee and he does not expect that you will answer them all immediately. If you run true to form, you will exhibit the engineer's usual contemnation, but you are going to meet some of these issues face to face at no far distant date. While our parent society has enshrouded itself in a mantle of pure patriotism and has taken the holy attitude that during the war engineers should remain within their burrows and address themselves to polemics, or pure science, an American Association of Engineers is clamoring for action and urging us to send a delegate to their convention in Chicago on May 14; our sister assocation of Cleveland is proposing a conference of delegates from the local assocations for the purpose of formulating amendments to the constitution which will give a more democratic form of government, and the San Francisco association is beseeching us to take an interest in our district representative on the nominating committee and to demand that he attend or resign in order that we may have a look-in in the affairs of the parent society.

"Dust the cobwebs off your ideas, notions, or fond hopes and attend; and let us see what manner of luminosity we can reflect. Come and help determine who is to represent us in Chicago. If you happen to know an engineer in or about Chicago, or one whose business will take him there, who might be delegated to represent our association, will you kindly notify the secretary?"

Open Specifications Held Legal by New Jersey Court

Open specifications for highway construction were declared legal by the New Jersey Court of Errors and Appeals, in a decision handed down May 5 at Trenton. The court upheld a ruling of the State Supreme Court which decided that the specifications of the Boulevard Commission of Jersey City for paving the Hudson Boulevard are legal in construction and requirements.

The action was instituted by an unsuccessful bidder on the ground that open specifications are illegal, and the decision is a distinct approval of this type of specifications in that they were upheld on every count.

The Boulevard Commission has voted to authorize the successful bidder to proceed with the contract, but should there be a disagreement due to increased cost of labor and materials, it plans to rescind the contract and call for new bids.

President Signs New Housing Bill

The President has signed the bill authorizing him to expend $60,000,000 on the housing of war workers, $10,000,000 of which is to be spent in the District of Columbia. In all probability, the administration of the money will be delegated to the bureau of industrial housing and transportation of the Department of Labor.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS; 29 West 39th St., New York; Spring meeting, June 4-7, Worcester, Mass.

NATIONAL MUNICIPAL LEAGUE; 703 North American Building, Philadelphia; June 4-6, New York City.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS; 129 York St., Brooklyn, N. Y.; June 19-22, Berlin, N. H.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION; University of Pittsburgh; June 26-29, Northwestern University, Evanston, Ill.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; June 27-29, Atlantic City, N. J.

AMERICAN SOCIETY FOR TESTING MATERIALS; University of Pennsylvania, Philadelphia; June 25-28, Atlantic City, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS; 29 West 39th St., New York; June 26-28, Atlantic City, N. J.

The Engineering Foundation, composed of representatives of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, will hold a special meeting Tuesday evening, May 28, in the auditorium of the Engineering Societies Building, New York City, to hear an address by Dr. George E. Hale on "The National Research Council."

The Russian Society of Engineers of Chicago was addressed May 22, by W. J. H. Strong of the Strong Engineering Co., on "Industrial Developments in America as Compared With Those Possible in Russia," and by W. W. DeBerard on "Engineering Publicity." This meeting was the first of a series proposed to bring Russian engineers in this country, as well as American engineers who are invited, to a realization of what they can do to further friendly relations by assisting in Russia's industrial development. It is purposed to send to accredited organizations in Russia translations of such addresses as may be helpful. The meeting was held at the rooms of the Western Society of Engineers.

The Associated Engineering Societies of St. Louis held a joint meeting under the auspices of the Engineers' Club May 15. Alfred D. Flinn, secretary of the Engineering Council, spoke on "The Engineering Council."

The Chicago Section of the American Society of Mechanical Engineers will hold a joint meeting tomorrow evening with the mechanical section of the **Western Society of Engineers**, at which John E. Ericson, city engineer of Chicago, will read a paper on the new Lawrence Ave. tunnel and the Mayfair pumping station, the most important recent additions to the Chicago waterworks system.

The Springfield Engineers' Club, Springfield, Ill., was addressed by Lieut. E. W. Silver of the signal corps, stationed at Chanute Field, Rantoul, Ill., who gave an illustrated address on aviation.

The Baltimore Association of Members of the American Society of Civil Engineers elected the following officers May 8: President, H. G. Perring; vice-president, E. B. Whitman; secretary and treasurer, C. J. Tilden. These officers, with H. D. Bush and Mason D. Pratt, past presidents, constitute the board of directors. The association has arranged to hold weekly luncheons on Thursday at 1 p.m. at the Chancery Inn, Calvert Building, Fayette and Paul Sts., which other members of the society are invited to attend as well as local members.

The Engineering Association of Nashville was addressed May 13 by R. S. Maddox, state forester, Tennessee, on the erosion of lands in western Tennessee and the filling in of valleys from this cause.

PERSONAL NOTES

COL. HUGH L. COOPER, National Army, who was to take charge of the Muscle Shoals dam across the Tennessee River, has returned to France for active service.

C. Z. MOORE has resigned as supervisor, Philadelphia division, Pennsylvania R.R., to become associated with John Lundie, consulting engineer, 52 Broadway, New York City. Mr. Moore has been in the engineering and construction department of the Pennsylvania R.R. since 1894.

G. E. LEMMERICH, who has specialized for a number of years in the design of railroad terminal structures, has become associated with the Austin Co., Cleveland, and will devote his entire time to this work. For a number of years the Austin Co. has specialized in the design and construction of standard building for rapid erection and is now engaged in designing similar railway terminal structures.

FREDERICK D. BROWNE, locating engineer, Alaskan Engineering Commission, has been appointed engineer in charge of the Fairbanks division with headquarters at Fairbanks, Alaska.

DUGALD C. JACKSON, William B. Jackson and Edward L. Moreland, comprising the firm of D. C. and William B. Jackson, engineers, Boston and Chicago, will suspend the business of the firm during the period of the war on account of the entrance of the members in the national service.

GEORGE B. DUSINBERRE, former water-works commissioner, Cleveland, has been commissioned major in the ordnance department and will be stationed in Washington, D. C. Early this year Mr. Dusinberre resigned from the water-works department to engage in private engineering.

J. I. BANASH, for the past eleven years engaged as engineer for Underwriters' Laboratories in examining and testing hazardous appliances, has been appointed engineer-in-charge of the casualty department, succeeding S. V. James, now mechanical engineer on special research work for the laboratories.

LIEUT. CYRUS MCCORMICK, JR., Chicago, has been placed in charge of the engineering department at the Chanute aviation field, Rantoul, Illinois.

SIDNEY J. WILLIAMS has resigned as engineer for the Industrial Commission of Wisconsin, to become manager of the accident prevention department of the National Safety Council. He was building inspector for the Industrial Commission of Wisconsin for four years and has been engineer for the commission, in charge of the safety and sanitation department, for the past year.

C. E. STONE, consulting engineer, Pittsburgh, has closed his offices to accept a captain's commission in the Engineer Reserve Corps.

GEORGE A. KIRLEY has been appointed signal engineer, Boston & Albany R.R. After his graduation from the University of Michigan in 1907, Mr. Kirley entered the signal department of the New York Central R.R. as a draftsman at New York. Two years later he became associated with the signal department of the Boston & Albany R.R. where he has served as chief draftsman and assistant engineer.

PROF. B. P. FLEMING, of the State University of Iowa, has received a captain's commission in the Corps of Engineers, assigned to duty at Camp Lee, Petersburg, Va.

HARRY R. WICKHAM, section engineer, Public Service Commission, First District, New York, has become associated with Westinghouse Church Kerr & Co. as assistant engineer.

J. A. ELLIOTT, for the past two years highway engineer of Wasco County, Oregon, has become highway engineer, office of public roads, Vancouver, Wash.

E. B. KARNOPP, chief engineer, Madeira Mamore Ry. Co., Brazil, has been commissioned captain in the Engineer Reserve Corps, assigned to the 22nd Engineers, on light railway construction.

CHARLES EVAN FOWLER, consulting engineer, New York City, has received the degree of master in civil engineering from Ohio State University, in recognition of his work and his contributions to engineering literature.

F. L. NEIDERHEIMER has resigned as city engineer of Bucyrus, Ohio.

K. K. KUNEY, district and maintenance engineer, Alaska Government Railways, has resigned.

D. C. BOWMAN has been appointed engineer maintenance of way of the St. Louis Terminals, Wabash Ry. Mr. Bowman was previously at the Kansas City terminal.

WILSON T. HOWE has been commissioned captain in the Quartermaster Corps, National Army, assigned to duty with the construction division at Washington, D. C. For the past few months Mr. Howe has been engaged in construction work for the ordnance department in the vicinity of Baltimore.

OBITUARY

Died in the Service of His Country

CAPT. HARRIS D. BUCKWALTER, corps of engineers, is reported killed in action in France. In 1910, Captain Buckwalter was graduated from Pennsylvania State College in civil engineering, and in 1915 took the degree of civil engineer. From the time of his graduation from the State College, he was engaged in surveying work, design of structural steel work, and design and construction of various public works, including sewers, streets, parks and concrete highway bridges for the Pennsylvania State Highway Department, with which he was associated from 1911 to 1914. In 1914 Captain Buckwalter became assistant engineer, Public Service Commission of Pennsylvania, and was put in charge of grade-crossing investigations and elimination. He enlisted in the army shortly after the entrance of this country into the war.

A. B. MAYHEW, division engineer, Miami Conservancy District, was drowned at the dam at Germantown, Ohio, May 12, while directing the work of saving a suspension bridge from destruction by flood. Mr. Mayhew had been associated with the Conservancy District work since 1914 and had an active part in the development of the plans for flood prevention in the Miami Valley. He was graduated from Tufts College in 1905, and became associated with the United States Reclamation Service in charge of construction of the rock-fill dam on the Blackfoot River, Idaho, and later in the construction of various canal work and bridges under the jurisdiction of the Reclamation Service. From 1911 to December, 1914, Mr. Mayhew was principal assistant engineer on design and construction of the Arrowrock Dam and related features. In 1914 he resigned from the Reclamation Service to become associated with the Miami Conservancy District. At the time of his death, Mr. Mayhew was in charge of the construction of the Germantown Dam.

LEVI HOWES, engineer on the construction of the first subway in New York City, died recently at his home in Brooklyn.

SCOTT MCKAY, county surveyor of Fresno County, Cal., for the past 16 years, died recently at Fresno.

CHARLES R. KAY, consulting engineer, Union Gas & Electric Co., Cincinnati, and formerly general manager of the Union Light, Heat & Power Co., Covington, Ky., was killed recently in an automobile accident at Cincinnati.

HARRY P. WILLS, for the last twenty years identified with canal and highway engineering work for the state of New York, died recently in New York City. After his graduation from Union College, Mr. Willis entered the service of the State of New York surveyors' division, and for several years was engaged in highway, canal and boundary surveys. He located the locks and dams on the Erie Canal from Troy to Amsterdam, and planned and built the locks and dams at Waterford, N. Y. Later Mr. Willis entered the engineering department of New York State under civil service, becoming resident engineer, state highway department. In 1909 he was appointed chief engineer of the highway department, which office he retained until he resigned in 1911 to devote his time to the development of a patented process of road construction.

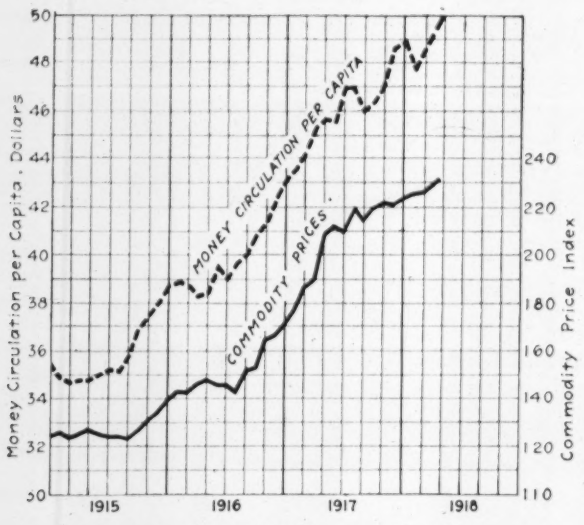
NEWS OF ENGINEERING INDUSTRIES

FOR MANUFACTURERS WHO SERVE ENGINEERS AND CONTRACTORS

Money Expansion Dominant Price Factor

Effect of Government Loans, War Requirements and Curtailed "Non-Essential" Production

About one to three months is required for an increase in the supply of money and credit to produce price advances, according to a leading statistical bureau. The effect of the expansion of money in circulation on the general level of prices, up to the present time, is indicated by the chart below, which shows a marked correspondence between money expansion and the increase in commodity prices.



PRICE INCREASES FOLLOW MONEY EXPANSION

Large credit expansion has had the same effect on prices as actual increase in the money supply. This has been shown to a marked degree since early in 1917 to the present time, during which period Government loans, bringing about an expansion of bank credit, have had a greater influence on prices than the increase in actual money in circulation and bank reserves.

Taking all of these factors into consideration, it appears that the general level of prices will continue to rise as long as the war lasts, with pronounced effect, not only with respect to buying but also with respect to sales, credits, labor and security values. Although the price changes to the present have been largely the result of other conditions, it is noted that many consequences may follow either an extensive increase or decrease in prices. As soon as peace comes into view, it is expected that there will be a sudden drop in prices.

The supply of goods ordinarily used in peace times is being steadily reduced in order to secure necessary production of war necessities, through the diversion of industry to war products, bringing about a shortage of ordinary commodities. Consequently prices advance. This is accompanied by the increasing demand of the Government for war supplies and materials entering into their production, bringing about an increase in prices for war products also. The fixing of maximum prices has met with only partial success. Fixed prices do not necessarily correspond with the general level of prices, and have a tendency to lead to such conditions as the coal famine of last winter through the elimination of marginal producers.

The experience of the past year has borne out the theory that depreciation in paper money values, as compared with gold, is not a necessary factor in bringing about an increase in prices. Commodity prices have been advanced simply through increasing the supply of money in circulation proportionately faster than the quantity of goods offered for sale. New money introduced into circulation causes an increase in buying power, although the quantity of goods offered for sale remains the same. Since no more goods can be purchased than actually exist, the buying power of money is decreased: prices rise. This is what has actually occurred, as shown by the chart.

After-War Aid Being Planned for Canadian Industries

The Canadian Industrial Reconstruction Assn., headed by Sir John Willison, is already giving consideration to the post-war industrial problems of Canada. The specific objects of the association are the maintenance of industrial stability and the securing of wise consideration and prudent treatment for problems of reconstruction.

The association will investigate conditions of various industries, the markets which they must supply, the price of labor as compared with wages paid in competing industries elsewhere, and the relative cost of transportation.

Baron Shaughnessy is honorary president of the association.

War Committee Surveying Steel Situation

Results Expected to Determine Status of "Less-Essential" Products—Output Increasing

To determine the most effective way to control and distribute the steel output of the country during the period of the war, a committee of executives of the steel industry and members of the War Industries Board was named at the conference that took place last week in the offices of the War Industries Board at Washington between Government representatives and leaders of the industry. It is expected that the findings of this committee will largely determine the status of the "less essential" manufacturers and will indicate how far the Government will go.

The only announcement made by the War Industries Board concerning the results of the meeting is contained in the following statement: "The War Industries Board has presented to the industry the increasing demands for steel to supply the military necessities of this country and its allies, and we have been discussing means of meeting this demand. The matter is under investigation. A joint committee of the steel industry and the War Industries Board is going to ascertain the facts and report them later."

On this committee are J. A. Farrell, president of the United States Steel Corporation: E. G. Grace, president of the Bethlehem Steel Corporation; H. G. Dalton of the Pickands-Mather Co.; J. A. Topping, chairman of the board of the Republic Iron and Steel Co., and E. A. S. Clarke, president of the Lackawanna Steel Co., all representing the steel interests, and these members of the War Industries Board: Alexander Legge, J. L. Replogle, and Gen. Hugh L. Johnson.

It is expected that in the meantime there can be little feature to the steel market until the committee has completed its survey of the situation and rendered its report. It is expected that the survey of the committee will be devoted largely to determining how a balance of production can be maintained between the manufacturing plants of the country, as the position has been taken that only thus can maximum production be obtained. Not only will the capacity of the producer be ascertained, but the needs of the Government, as closely as possible. It is even hoped that the information collected by the committee may make it possible to distribute a certain proportion of steel products for ordinary commercial purposes, which could not be done so long as there was doubt of the propriety of such distribution.

While the trade is eagerly awaiting the committee's report and the conclusion of its survey, it is noted that the situation for the past month has been marked by increasing production. During April the rate of steel ingot production was 42,650,000 gross tons a year, the highest rate attained since last November. It is stated that there has been a material increase in production since April, and that the present rate is probably 45,000,000 tons a year, or the highest ever reached. Accompanying the record-breaking steel production is a shortage in iron supply, and in many cases it has been impossible for the steel mills to secure reserve stock. In view of the Government plans for a new ordnance plant, it is expected that large orders for structural material will soon become a strong figure in the market.

War Labor Board Mediates in Three Disputes

The National War Labor Board has appointed several sections, or committees of its members, to mediate a number of controversies which have been brought to the attention of the board. William H. Taft and Frank P. Walsh, joint chairmen of the board, will inquire into the controversy between the operating companies and the employees of the street railways in Cleveland and Detroit. It is expected that Messrs. Taft and Walsh will visit Cleveland on May 27 and Detroit on May 29 to make a first-hand investigation.

Adam Wilkinson and Frederick C. Hood were selected to investigate the dispute between the employees and the General Electric Company at Schenectady, N. Y., and Pittsfield, Mass. On May 22 Messrs. Wilkinson and Hood visited Danbury, Conn., in regard to the controversy in the hat manufacturing industry in that city.

May Make Commercial Bribery Criminal Offence

The Federal Trade Commission has sent to both branches of Congress a communication urging "the enactment in the public interest, as an aid to the preservation of fair and free competition, of a sufficient law striking at the unjustifiable and vicious practices of commercial bribery; and that such law be so comprehensive as to strike at each person participating in any such transactions."

The Federal Trade Commission has found commercial bribery to be general throughout many branches of industry, and scores of complaints have been issued by it on that account. Fourteen states at present have laws prohibiting such practices, but they fail to reach the root of the evil and eradicate it. The Commission can only deal with commercial bribery as an unfair method of competition, as it has no criminal jurisdiction, and can deal only with one side, having no power to reach the receiver.

War Spirit Dominates Joint Supply Convention

Meeting of Manufacturers and Dealers In Cleveland Discusses Industrial War Problems

Discussion of war problems dominated the joint convention held in Cleveland, May 15-17 by the American Supply and Machinery Manufacturers' Assn., the National Supply and Machinery Dealers' Assn., the National Pipe and Supplies Assn. and the Southern Supply and Machinery Dealers' Assn. More than one thousand members of these organizations attended the joint "war convention" to discuss important problems imposed by war conditions upon their business activities.

In order to bring together the entire representation of manufacturers and dealers, the principal meetings of the convention were joint sessions, and separate meetings of the individual associations were held only for the transaction of routine affairs essential to the conduct of the separate associations.

The discussions throughout the convention brought out very clearly the tremendous amount of work being done in supplying necessary war materials by the supply and machinery trade. The importance of this work was brought home by several of the speakers. Emphasis was laid on the desirability of proper coöperation between manufacturers and dealers, showing how dealers' stocks in the vicinity of consuming points prevent delays that might otherwise be caused by congested traffic conditions.

The success of certain manufacturers in obtaining an adequate supply of skilled labor through the speedy training of unskilled men and women in specialized operations was outlined by other speakers. H. E. Miles of the Council of National Defence addressed the convention on the labor situation as it existed in war industries. Mr. Miles called the idea a fallacy that there is an abundance of supply of labor in the country for war work. He explained that of the so-called skilled labor constantly applying for employment, but 10% is capable of doing satisfactory work as machinists. The labor turnover, he said, is an enormous problem for the nation, as is also the practice of taking skilled men from other shops and transferring them from one city to another at great expense.

The factory training school was designated by Mr. Miles as the means of solving the labor problem for winning the war. In order to bring about the introduction of women and older men into war work, as has been done in France and England, he pointed out the desirability of a closer division of labor during the war, so that an inexperienced hand could learn to do one small operation efficiently. It was pointed out that women workers and young men entering war industries with fresh minds become wonderfully efficient machinists, and invariably have been the means of exceeding the output of a shop under the old system, the increase ranging from 20 to 200 per cent. This competition of new workers has brought about the stimulation of older men workers, accompanied by increasing production, often merely through the fact that training schools were established at the plants in which they were employed.

The convention dealt extensively with post-war problems, and concluded that not only must our natural resources be greatly developed, but also that our foreign trade must be extended. The railroad situation was reviewed, and a forecast was made of increased freight rates and the return of the railroads to private ownership after the war.

Will Intensify Ordering Drive During "Coal Week"

The United States fuel administration has designated June 3 to 8 as "Coal Week," following a period of special effort made throughout the country urging the early ordering of coal. "Coal Week" is to be devoted to an intensive drive to further this movement.

With the bulk of the year's coal supply ordered well in advance, it is thought that the various distribution agencies of the Government will be in a position to adjust the demands for fuel between communities and industries, as it will be possible for the fuel administration to gage the increased demand and apportion the available supply.

Production of coal is steadily increasing, but it is said that it must be further increased to meet the requirements for the year. Recently some mines have actually been shut down on account of a lack of orders, although many communities have placed orders for one-third of their industrial and domestic requirements, and in the East dealers have been overwhelmed with early orders for anthracite.

An intensive campaign will be carried on during "Coal Week" to bring the fuel administration's early coal ordering message before the public through poster displays, moving picture theaters and four-minute speakers. The services of coal dealers throughout the country have been enlisted.

Cleveland Company Institutes "Vestibule School"

The Cleveland-Osborne Mfg. Co., Cleveland, is putting into effect a "vestibule school," through which all shop employees will pass before being finally placed in the organization of the company, the school at the present time being devoted to incoming employees. An experienced engineer familiar with shop operation is in charge of the school and is assisted by the shop efficiency engineer.

When a man who applies for employment by the company has had no ex-

perience especially adapting him to any one of the several departments of the plant, he is tried out in the school and placed in the proper department after he has been trained for the work.

Industrial Exhibits at Water-Works Convention

To meet war conditions, only light industrial exhibits were permitted at the convention of the American Water-Works Manufacturers' Assn., held at St. Louis last week. The 47 firms which exhibited found that the elimination of heavy machinery was a happy innovation. The actual saving was no small amount. As put by one salesman: "People in whom we are interested can read drawings readily and can easily reconstruct a machine from a set of photographs." A few models, many interesting pictures and plenty of literature comprised the exhibit. A multiplicity of flags added to the patriotic spirit which was so pronounced throughout the convention.

For the next year the association elected the following officers: President, T. C. Clifford, Pittsburgh Meter Co.; vice-president, E. D. Kingsley, Electro Bleach Co.; treasurer, Charles R. Wood, R. D. Wood & Co.; secretary, John A. Kienle, Electro Bleach Company.

Manufacturers Predict After-War Control of Industry

The prediction that the present federalization of national resources under war conditions would result in the permanent enlargement of national control over industrial and commercial life of the country after the war was made at the opening session, May 20, of the 23rd annual meeting of the National Assn. of Manufacturers in New York City, announced in *Engineering News-Record* of May 2, p. 887. The prediction of continued control of industries was contained in the report submitted by the committee on interstate commerce and federal incorporation.

The report read in part as follows: "One of the results of this federalization of our resources will be the permanent enlargement of national control of our industrial and commercial life. We do not believe that there will be a return of pre-war conditions, for we hold that efficiency of a larger degree of national administration will justify itself in post-bellum conditions.

"We do not mean to imply the slightest change in our structure of government nor that the inherent powers of the various states will be diminished. We merely mean to suggest that from the experience in nationalization the result would prove the wisdom of a more centralized and less diverse and devious control of our industries, commerce and trade."

In another committee report the importance of industrial teaching was emphasized. Industrial training of "an exceedingly intensive and immediate and practical kind" was urged as a necessary war measure.

Limit Use of Bituminous Products in Road Work

Petroleum, asphalt, or tar products, wanted for the construction, maintenance or reconstruction of roads, will be delivered only after approval of an application by a committee representing the United States fuel administration and the Office of Public Roads of the Department of Agriculture. The announcement was made by officials of the two federal agencies named. This action is taken not only that the limited supply may be conserved sufficiently to meet the needs due to the war, but also that by regulating the use of them ample stores may remain to assure the proper maintenance of bituminous roads. The value of such roads is estimated by the Office of Public Roads to be more than $1,000,000,000.

Forms, on which all applications for bituminous products for highway work must be made, have been supplied to the State highway departments, to which notices of the restrictions have been sent, and they are required to pass upon all applications for highway work in their territories involving the use of these materials. The applications must then be sent to L. W. Page, director of the Office of Public Roads, Washington, D. C., who is chairman of the committee which will consider the necessity of supplying the material and will make recommendations to the oil division of the fuel administration. When material is available, permits will be issued by the oil division in accordance with the recommendation. Preference will be given to requests for materials wanted for maintenance, and it is requested that all new road construction involving these materials be deferred, unless such work is necessary in the prosecution of the war.

64% of Structural Shop Capacity Contracted for in April

Sixty-four per cent. of the entire capacity of the structural and bridge shops of the country was contracted for during April, according to records collected by the Bridge Builders' & Structural Society. As mentioned in *Engineering News-Record* of Apr. 25, p. 842, only 47% of the entire capacity of the shops was contracted for during March. This condition was understood to be due to the inability of the mills to furnish the shops with a sufficient quantity of plates and shapes to maintain full capacity production, rather than to a shortage of orders for delivery in the near future.

Pneumatic Calking Machine for Wooden Hulls

A pneumatic calking machine which automatically tacks machine or hand-spun oakum in side or bottom seams of wooden ship hulls is shown in operation in the accompanying illustration.

The machine is controlled by a trigger similar to a light pneumatic scaling hammer. It differs, however, from the usual hammer in that the piston has an extended rod fitted with a thin calking blade, which acts as a reciprocating iron with positive back pull to avoid the tendency to bind. The calking iron travels in guides which prevent it from turning, the whole being fitted with springs so that the operator can vary

CALKING BY COMPRESSED AIR

the penetration of the calking iron with the varying depth of the seam. A special device automatically feeds the oakum with each movement of the calking blade. Guide wheels run in the seam and keep the threading iron lined up. Its working speed is about 1500 tacks per minute, either coiling or running the oakum straight.

This tool has been placed on the market by the Ingersoll-Rand Co., New York.

BUSINESS NOTES

L. A. Ferguson, formerly manager of the Eureka Machine Co., Lansing, Mich., has become associated with the Ideal Engine Co., Lansing, as special representative.

The Thomas Moore Trench Machine Co. is to locate a plant in Rockaway, N. J., and will commence operations in the near future. The repair work on the building in which the company will be situated is nearing completion.

A. W. Payne, manager of the Eastern territory of the Crane Packing Co., has become sales manager of the company for the United States and Canada, with headquarters at the main office, Chicago. Julian N. Walton has been appointed manager of the new office of the company in the Park Row Building, New York City.

W. J. Roberts has been appointed president of the Traylor Engineering & Manufacturing Co., Allentown, Penn., succeeding S. W. Traylor, who has resigned to undertake other duties.